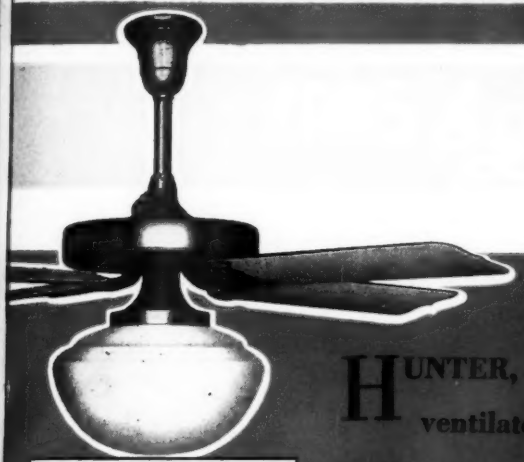
ELECTRICAL SOUTH

MAY
1944



52-In Hotel Type

55th SEASON

24-In "Airspread" Ceiling

HUNTER, who has made fans and ventilators exclusively during 55 years, is now operating under War Production Board restrictions. • No more fans will be made except for the Army, Navy and Maritime Commission. HUNTER unfilled orders now on hand represent contracts with Government Agencies. • Certain sizes of belted exhaust types can be made available for Government hospitals and other war industries, subject to limited material inventories now on hand.

HUNTER FAN & VENTILATING COMPANY, INC.

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General Sales Offices: Memphis, Sterick Bldg. *Eastern Sales Office:* New York, 92 Warren Street *Western Sales Office:* St. Louis, 1706 Olive Street

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Zephair Comfort Cooling and Commercial Ventilators

Sales Offices:
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CLEVELAND
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KANSAS CITY
NEW ORLEANS
PITTSBURGH

Where reverses bring success . . .

Rapid reversals for various motions on modern high-speed machine tools provide the opportunity to decrease machining times. Multiplied by the number of reversals per work cycle and the number of cycles per day, these operations add up to a sizeable number of man-hours. In a postwar competitive market, the savings on time can mean the difference between success and failure.

Regardless of the application—lathe—drilling and tapping machine—multiple spindle drill—there is a Westinghouse A-C reversing drive to fit the job. Successful installations, proved in use, include lathe drives capable of reversing 15 to 25 times a minute and drills, 14 to 60 times a minute.

For example, one machine tool builder uses a Westinghouse multiple-speed motor rated at 3/2/1-1/2/1 hp, 3600/1800/1200/600 rpm, and providing 6, 14, 24 and 60 reversals per minute for these speeds, respectively.

The determination of the proper rating and size of motor for a specific machine tool application is but one of the many problems of machinery electrification for which Westinghouse can supply you the proper answer. This ability to provide simple electrical solutions to complex mechanical problems is yours for the asking. Just call your nearest local office. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

J-94619

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

THE MACHINE IN MACHINE TOOLS

HAZARD CABLES

to fill many needs...

The wide range of cables made by Hazard provide for many problems met in the course of the day's work. Here are examples, designed for specific requirements and built to withstand a number of severe conditions. Hazard research and experience are at your command to help in choosing the right cable for the right job.

HAZARD SERVICE CABLES FOR SERVICE DROPS AND ENTRANCES

Type SE (ABN and UBN) cables, with synthetic rubber insulation, prevent current diversion, eliminate conduit and extra fittings and are architecturally harmonious. Type SD is efficiently designed for service drops. Sizes 12 to 2 inclusive, 2 and 3 conductors.

HAZARD PERFORMITE TYPE RH BUILDING WIRE IS SUPER AGING

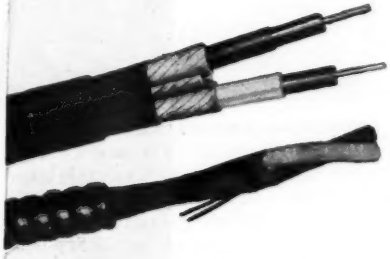
This heat-resistant long-life wire is free stripping and easily installed. Because of its greater carrying capacity, it saves strategic copper. Recommended for branch feeders and general light and interior wiring. All sizes available.

TYPE R HAZACODE WIRE

exceeds all minimum requirements of N.E. Code and is recommended for general interior building wiring; has a sturdy, long lived, flameproof braid covering, and is readily installed.

TYPE RL HAZACODE LEAD ENCASED

is particularly useful now for damp locations while Type RW is unavailable.



HAZARDEX NON-METALLIC SHEATHED CABLE AND HAZARD ARMORED CABLE

for interior wiring are both obtainable. These familiar types of cable are made to exacting Hazard quality standards.

TYPE K FABRIC COVERED CORD—an approved cord for ordinary use.
TYPE KK HAZARD SPIRALWEAVE CORD a portable cable for heavy duty.

Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

HAZARD

ELECTRICAL WIRES AND CABLES

ARMY E NAVY

3641

ELECTRICAL SOUTH is published monthly by W. R. C. Smith Publishing Co., Marietta, Ga., and Atlanta, Ga., U. S. A.
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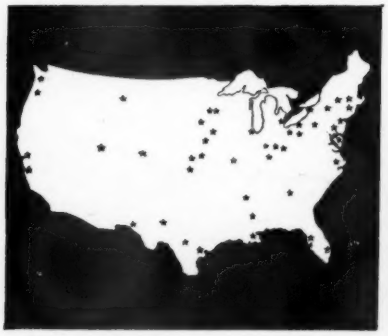
Volume 24 Number 5

FRIGIDAIRE Thinaire SERVICE — BETTER CARE LESS REPAIR

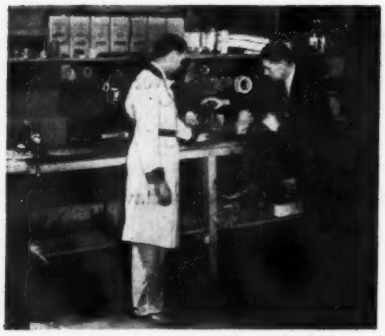
Frigidaire's Wartime Service Program Helps Dealers

EXTENSIVE FACTORY FACILITIES are devoted to the manufacture and distribution of parts and assemblies, so that Frigidaire dealers may keep the millions of Frigidaire refrigerators and other installations in essential wartime operation.

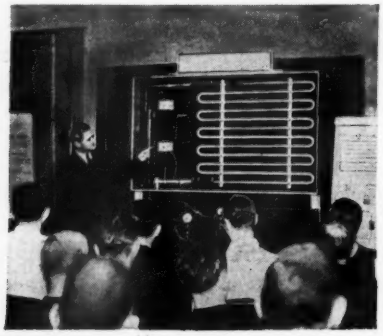
PARTS—thousands of different kinds are stocked here, ready to be sent to dealers for use in Frigidaire models of the past 25 years. On hand for making these service parts are thousands of tools and dies used for the original Frigidaire parts.



45 DISTRICT SERVICE ORGANIZATIONS blanket the country, giving Frigidaire dealers everywhere quick access to the most commonly needed replacement parts, extensive repair facilities, supervisors who assist them on technical matters.



TRAINED TECHNICAL MEN are available to individual Frigidaire dealers to help them work out any special service problems that may arise...help the entire Frigidaire Dealer Organization in carrying out effective serviceman-training programs.



FIELD TRAINING SCHOOLS by factory and district instructors give hundreds of new and experienced servicemen basic and advanced training in Household and Commercial Refrigeration, Electric Range work. Night school classes are popular.

SERVICEMAN-TRAINING AIDS include Primary and Advanced Training Courses, streamlined field schools, 9 valuable training films, a timely manual and film on customer relations, Handy Reference Guides, 2 comprehensive Service Manuals.

5 IMPORTANT OBJECTIVES

Started more than two years ago, Frigidaire's Wartime Service Program is a *continuous* major activity to help dealers accomplish these important objectives:

1. To cooperate with the Government's Food Conservation and Health Protection programs.
2. To help keep the nation's refrigerators running.
3. To locate and train necessary service manpower.
4. To obtain essential service parts.
5. To build good will and maintain income.

For Excellence in War Production — ARMY E NAVY

FRIGIDAIRE
Division of
GENERAL MOTORS

Peacetime builders of
ELECTRIC REFRIGERATORS · RANGES · WATER HEATERS
HOME FREEZERS · ICE CREAM CABINETS
COMMERCIAL REFRIGERATION · AIR CONDITIONERS
BEVERAGE, MILK, AND WATER COOLERS

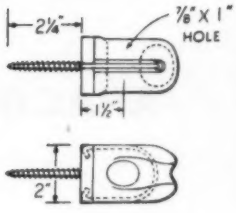
BUY MORE WAR BONDS FOR VICTORY!

★

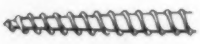
Listen to
GENERAL MOTORS SYMPHONY OF THE AIR...
Every Sunday Afternoon, NBC Network

★

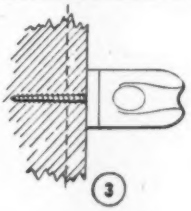
HUBBARD 4-11-44 WIREHOLDERS



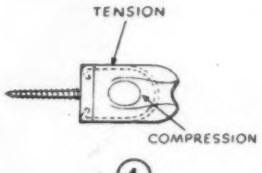
1 Two Views of Hubbard 4-11-44 at 90° Turn



2 Special Screw



3 Full Thread



4 Cut-away Section

1 Two diagrams of the Hubbard 4-11-44 Wireholder showing its sturdy construction. Tests on these wireholders, dead-end pull, have far surpassed recommended ratings on standard house service conductors. This is true of the wireholder itself. To insure maximum strength of an installation, a solid mounting is necessary. Attachment to sheeting so thin as to engage only a small portion of the screw (as shown by dotted line in Fig. 3) naturally reduces the holding power of the installation as a whole, no matter what the strength of the wireholder may be. This should be avoided.

2 Not an ordinary wood screw, but specially designed with a sharp point and a small root diameter near the point to allow easy starting. A light pressure is sufficient to start the screw in wood.

3 Full threaded screw, so that unavoidable installations on thin material are not caused to be excessively weak by lack of threads near the base. (See dotted line showing how installation on thin wood will not develop full strength of wireholder owing to reduced holding area of screw threads.)

4 A "tried and true" Hubbard Wireholder principle of thirty years success. Metal parts in tension — Porcelain parts in compression under load.

HUBBARD AND COMPANY

Pittsburgh **Chicago** **Oakland** **California**

(Here's another ad in the series that brings a vital message to your customers.)

What wonders do you see in store for the

POSTWAR ELECTRICAL HOME?

Television? Air conditioning? Automatic kitchens? Electronic devices to make heating, lighting, cleaning—in fact, homekeeping—far easier than ever before? Yes, but hold on a second . . .

Something else has got to precede them all! Electrical wiring—better wiring—adequate wiring. Without it no home or plant or business can begin to utilize all the coming electrical possibilities. And now is the time to plan for it—in advance.

Wiring has to come first—then why not put it in the forefront of your postwar thinking? Talk to the power engineer of your local utility, your electrical contractor, and get their ideas.

Remember . . . *unwired* planning will cost you a whole lot more than *planned wiring!*

44218

ANACONDA

ANACONDA WIRE & CABLE COMPANY

25 Broadway, New York 4 . . . Sales Offices in Principal Cities

Electrical Wires and Cables of Copper are the Life Lines of our Nation

ELECTRICAL SOUTH

VOL. 24 MAY 1944 NO. 5

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W. E. COOGLER, *Production Manager*

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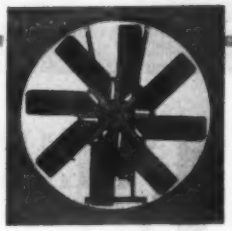
.....for SUMMER'S NEEDS

Coolair TRADE MARK



EXHAUST FANS and BLOWERS

DO YOU KNOW that the majority of your commercial and industrial prospects can now purchase COOLAIR Ventilating and Exhaust Fans and Blowers? Many active dealers and distributors have been soliciting *and* selling orders for summer business for the past several months.

HERE ARE 4 REASONS

. . . why you should contact all of your prospects now:

1. CMP Regulation 5 permits almost any type of business, able to certify that the equipment they order is necessary to the successful operation of their business, to assign their own preference ratings on purchases up to $500 in value. Form PD-1 A can be filed for orders in excess of $500.

2. Many Army and Navy orders are still available to wide-awake dealers who keep in touch with these prospects.

3. Even though your prospect may not actually need Coolair Fans for 60-90 days or longer, his order should be placed now to insure delivery for this summer's use.

4. Wartime shortages of manpower and materials are a constant threat to production schedules. Plan ahead and act NOW!

BEGIN TODAY... contacting your prospects at once and let us know if you need additional information. Send for a supply of Coolair literature and the 1944 price list.

A full description of the Coolair line, with tables showing models, dimensions, performance data, etc., can be found in SWEET'S CATALOG A.S.H.V.E. GUIDE ELECTRICAL BUYER'S REFERENCE

AMERICAN COOLAIR CORPORATION...Manufacturers

3604 MAYFLOWER STREET

JACKSONVILLE 3, FLORIDA

ELECTRICAL EQUIPMENT

for the *Mammoth Plant* or the *Modest Building*

In post-war planning which involves expansion, modification or otherwise changing plant set-up or arrangement, the electrical system will doubtless require changes also. FA Engineers can be of great assistance in working out plans and specifications for economical and efficient service. Architects, engineers, and management are invited to submit their electrical problems — without obligation.

In the planning of new homes, stores, commercial or public buildings, or of remodeling existing structures, FA Products deserve consideration.

Load Centers and Service Equipment for homes . . . Panelboards for stores and commercial buildings . . . Switchboards — Feeder and Plugin Busduct distribution systems — Distribution Panelboards for power and light, for large and small plants . . . no matter what the requirements, FA can fill them . . . And FA Products are not only *approved* by Underwriters' Laboratories, Inc. They *exceed* the Laboratories' requirements.

Should standard FA Equipment not suit your purposes, we design and build equipment that will fit your specific needs.

More than fifty years of experience in keeping abreast or ahead of developments in the electrical field have given us the "know how". Use it to advantage — and without obligation.

Bulletins Are Available

on most of the FA Products listed at the left. Write for the ones in which you are interested — and for the name of the nearest FA Sales-Engineer . . . Frank Adam Electric Company, Box 357, St. Louis, Mo.

FA PRODUCTS

- **FA Busduct** — Feeder and Plugin Types and Plugin Devices
- **FA Duct** — for Wire and Cable
- **FA Panelboards and Cabinets** — Standard, Column and Dust-tight Types with Switch and Fuse, or Circuit Breaker
- **FA Service Equipment** — Standard or Special Switch and Fuse or Circuit Breaker Types
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- **FA Shutlbrak Switches** — Enclosed Safety Type
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- **FA Quikheaters** — Built-in or Portable

Frank Adam
ELECTRIC COMPANY
ST. LOUIS

America Unlimited!

By Eric A. Johnston*

President, Chamber of Commerce of the United States

IT SEEMS TO ME that we ought thoroughly to understand that the light and power industry and the entire electrical industry have made a major contribution to this war and production; particularly the light and power industry which, against some of the official pronouncements of certain people, has been able to provide electrical energy to the home, electrical energy to the farm, and electrical energy to the factories of the American people for war production. The electric light and power industry should be proud of the fact that it has been able to deliver the power, which makes the energy, which makes the wheels go round, which makes the goods, which are destroying the house that the Axis built.

We should all understand that we are going up to greater heights of power and prestige in the electric light and power industry, just as the American people will go to higher heights of prestige and power in other fields in the post-war period.

There is probably no industry in America that has greater opportunities in the future, greater mountains of accomplishment to scale.

I was very glad tonight to hear Dr. McClellan talk about free enterprise or what he calls "individual" enterprise. It was a lion-hearted man who, even as little as a year or so ago, stood on a public platform and talked about free enterprise. Those who did so did it in hushed tones and didn't wish to be quoted. But now we have a sudden — yes, almost an alarming — conversion to free enterprise, or individual enterprise if you wish to call it that. Even Earl Browder is for free enterprise. I am not so sure whether these people have searched their souls or are watching the polls. I am not so sure whether they speak from conviction or from convenience. But even though everyone is for free enterprise today, I think that we should make certain distinctions.

I am one of those who believes with every fiber of his being that our political freedoms, our unique individualism, our enrichment and expansion as a nation, are dependent upon the job of preserving individual initiative in America. I do not hold that free enterprise is a goal in itself, but that free enterprise or individual enterprise is merely a means of attaining and preserving a manner of living which, with all of its faults, has given greater happiness, greater contentment, and higher standards than any other system that has so far been devised by man.

Our program, it seems to me, is to stimulate this individual to his greatest productive capacity, with the understanding and realization that all of our benefits flow from the individual American human being. We must allow the individual to make his best efforts and to reap his just rewards and deserts, and I believe the average American has found that the vehicle of creative competitive capitalism does this better than any other system, for Americanism and capitalism are synonymous. Our program, as I said, is to stimulate the individual and unshackle and unleash his productive capacity, so that we can attain greater production and a higher standard of living in the world of tomorrow.

The other day a government official said to me—and I know that his views represent the thinking of a great many other people in and out of government—"Eric, never

Eric Johnston's entry and rise to prominence in the electrical field reads like a Horatio Alger story. His mother had purchased $2,500 of commercial paper in a company which sold vacuum cleaners and washers. Many of the purchasers defaulted in their payments which resulted in the machines being taken back and it was then that Mr. Johnston envisioned his first business opportunity. He took a job as door-to-door salesman and although he didn't make a single sale for the first two weeks, his perseverance was unfaltering. The next week he sold four machines and success continued.

By this time he had become enthusiastic over the possibilities which this new job offered, so much so that he bought an interest in the company. Later on, he borrowed money and purchased the largest electrical concern in Seattle and paid off the entire loan in a period of six years.

Today, he is president of: Brown-Johnston Company, electric appliance retailers; Wayne-Burnaby, electrical contractors who work on jobs of a million dollars each, or better; and Columbia Electric and Manufacturing Company, manufacturers.

*An address before the 10th Annual Meeting of The Electric Institute of Washington, D. C.

again will it be possible for a poor man to become wealthy in America. Never again will it be possible for a poor man to own and develop a large business of his own. What we must do in the future is to divide what we have so that there will be no want on the part of any of us."

I am one who vehemently disagrees with this theory of maturism in America. I am one of those who feels that our program must be one to enlarge our horizons, to open up new vistas of success and accomplishment; to allow the American people to see that the road ahead can lead to greater heights than anything that they have ever known before. I realize that the program will not be an easy one. Yet, I also realize that we have not reached the last frontier of American civilization, that we are bound to explore the horizons of tomorrow.

May I use an illustration. Out in the West we have eleven Western States. If I eliminate California and Washington, which are perhaps most highly developed, and substitute the two Dakotas, you have an area which is approximately the size of all of India, or of all of Europe outside of European Russia. This area of eleven Western States contains a population of about 9,000,000 people. In India there are 385,000,000 people, and in Europe outside of European Russia, 265,000,000 people.

Our Unlimited Resources

But, you say, there are not the resources in these eleven frontier states that are yet undeveloped. I tell you that there are more known natural resources in these eleven Western States (and they are far from all explored) than in all of India or all of Europe put together. You say that there are not the agricultural lands in these eleven Western States, and I tell you again that there are lands under cultivation or capable of being brought under cultivation by proper irrigation and reclamation procedures which will approximate the land under cultivation in India or the land under cultivation in Europe outside of European Russia.

In the State of New Mexico alone there is sufficient coal in known seams and known deposits to last the United States at its present rate of wartime consumption for 450 years, and yet we don't consider New Mexico as a coal state out in the West.

Does that indicate that our frontiers are gone? Does that indicate that there is no room for expansion in America?

Yet the greatest expansion, and the greatest frontier that our country has, lies in the enrichment of the people. We have never produced enough in America to provide a minimum modern subsistence standard of living for all of the people of the United States alone, and please do not forget that the prince's luxuries of today are the pauper's demands of tomorrow. We have only begun to enrich these people who have come to our shores to escape religious persecution, to find a new way of life in America. We have given them new horizons; we have given them new opportunities; we have given them new goals. There is something indigenous in the soil of America that makes a new race of people more productive than they were in their old habitats before.

I could cite numberless new inventions and new processes, new techniques, and new materials of the world of tomorrow. Allow me to take just the airplane alone. Had I stood before a group of this kind forty years ago and told them what the automobile would do for America, most of them would have laughed at me. Had I told them that it would spread ribbons of concrete across the country from east to west and from north to south, that on these ribbons of concrete there would be more than 30,000,000 passenger cars moving with the speed of the wind; told them that it would decentralize our cities, change our shopping areas, revise our ways, they would have thought that I was dreaming dreams.

I have no idea what the airplane will do for the world of tomorrow. All I can tell you is that in this room tonight you are no more than sixty hours from any point in the world; that within five years after this war, you will be no more than thirty hours from any place in the world. All I can tell you is that you will go places and do things that you have never contemplated before. What effect it will have upon our cities, upon our way of life, upon our civilization, I can't tell you.

I wish that I had time to tell you what other things are going to do for America, but I can only tell you this evening in all sincerity that there were never greater opportunities in the world opening for our people than there will be after this war. New methods, new techniques, new products, new ways of doing things, will crowd themselves in never ending fashion on the minds and the consciousness of the American people.

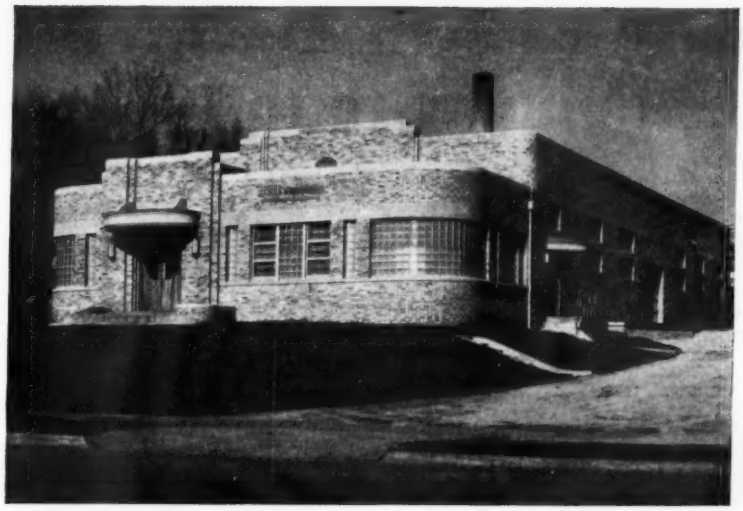
Our Unlimited Future

I thoroughly realize and understand that periods of history are very much like stretches of land. You go for a long time, sometimes almost across the continent, with pretty much the same, and then suddenly you come to the land's edge; suddenly you come to the water's beginning. Beyond lies the great unknown, the open sea. We are like the pioneers on the continental edge of one of those great periods of history. We are like Columbus taking off from the European shores. We do not exactly know where we are going; there is dissension in our crew in attempting to reach our destination and probably when we arrive at that goal it will be quite a different goal from that we imagined.

All I can tell you, again, is that there are looming up through these nebulous fogs of tomorrow certain definite things which we can characterize, describe, label. The first is that we in America have done something with people; we have brought forth a new race. Those of you who are familiar with metallurgy realize that a pure metal is never the strongest. It takes the alloy, other metals, to give a keen cutting edge, a sharp surface, a tensile strength. We in America are an alloy of all races, creeds and religions. We in America have built up a fiber of people who are toughened in spirit and mind and heart. We in America have a moral consciousness of the world of tomorrow that we can develop, and we shall attempt to achieve that world of tomorrow.

We realize that the airplane has shriveled distance, has made the oceans into lakes; we realize that it has telescoped time, but that none of the hates, loves, fears, ideologies, customs of peoples have been breached. These things are pretty much the same as they were a hundred or two or three hundred years ago. We realize that when war ceases we will not have peace;

(*Continued on page 22*)



The modern new plant of the Bell Armature Works, Knoxville. The ability of this organization to produce parts to extremely close tolerances has enabled it to expand from a "hole in the wall" to the ultra modern building and facilities shown here. Under a subcontract, it produces precision units essential to the Army Air Forces.

Production Achievement By Knoxville Motor Shop

By Warner Ogden

FROM a "hole in the wall" to one of the most modern plants in the country—the kind electrical men dream about for postwar days —that is the Cinderella-like transformation of the Bell Armature Works, Knoxville, Tenn.

It is a story of achievement in wartime and "amazing" is the only word for it.

Bell, a native of Atlanta, who attended Georgia Tech, started his shop under a ramp of the Gay Street viaduct in Knoxville because rent was cheap. The ramp was his roof. When he needed more elbow-room he dug out another small room.

He started out with a second-hand vise, a pair of pliers, a hammer, and a 2x12 plank.

He married a girl who was an inspiration and a help. They were so poor that Bell had to walk and carry armatures to make deliveries. They couldn't afford to hire anyone to stay at the shop, so his wife remained there while Bell was out "hoofing it" with the armatures. Mrs. Bell didn't sit and twiddle her thumbs in the shop though. She liked to do simple things. Gradually she learned to wind armatures, run a lathe and do other jobs.

They saved enough once to buy a second-hand car. They started on a trip to Chattanooga to celebrate, but a bus smashed into the car near Lenoir City, Tenn. Then both of them were confined in hospitals because of illness. But they refused to be discouraged. They kept on repairing and overhauling electric motors. Came the war! They wanted to do something to help. Bell set out to get some sort of subcontract. On his first attempt, he found a prospect who inquired if Bell would attempt to make small precision parts for the AAF Materiel Command.

Bell consented to give this new government work a try on a small scale. He bought necessary equipment to make small precision parts. With this, he and his wife started on the contract.

He began by training several deaf-mute employes on this type of work. Others have since supplanted the deaf-mutes. Stewart S. Neff, Knoxville district manager of the Smaller War Plants Corporation, gave a helping hand, and Bell began to expand operations and train more employees.

The War Production Board insisted that the Bells erect a modern building for mass production of the precision parts. Today they have a "dream plant" on the Chapman Highway in Knoxville. It is a plant with curves instead of square corners, glass blocks instead of windows, and with streamlined, modernistic effects such as artists like to draw in picturing the "plant of tomorrow."

The most efficient machinery obtainable was installed.

Now the Bells have more than $300,000 in Materiel Command contracts and is producing more than 18,000 units per month.

In commenting on the unusual

(Continued on page 40)

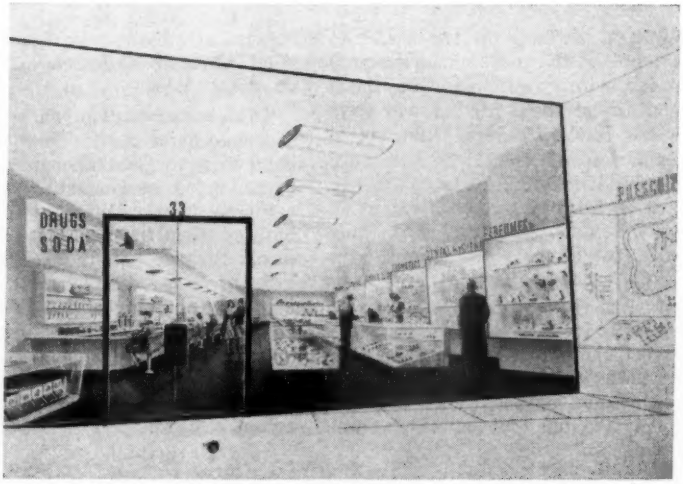
Mr. and Mrs. John W. Bell proudly display the Army-Navy "E" flag which was presented to them in April for the part their shop is playing in the war effort.

Nationally Known Architects Cooperate to Design

Sponsored by the lamp department of the General Electric Company at Nela Park, ten able American architects are designing simple, functional lighting effects in a variety of postwar interiors. Seven already have submitted plans. Here your editors proudly prevue the complete detail of two dramatic postwar stores.

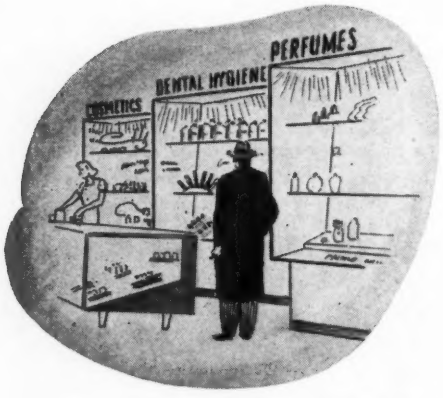
In the half-ceiling above the fountain, recessed fluorescent fixtures add attraction to the interior. The racks that hold fountain glassware are backlighted to emphasize clean and convenient fountain service. The racks themselves become functional lighting units for behind-the-counter service.

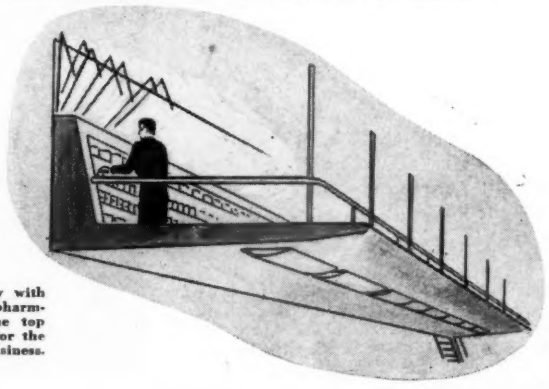
This shadow-box display, outside the window of the store, capitalizes upon the fact that the more drug products the customers can see and the more easily they can see them, the more they buy.



As seen from the street, the all-glass front of the dramatic postwar drugstore, designed by J. Gordon Lippincott of Dohnar and Lippincott, is diagonal. It has been recessed to perform two important functions, attract maximum attention and minimize glaring reflections. A single, simple change in store-front design together with modern lighting makes the whole interior clearly visible, stops casual passers-by.

Offset back-wall cases, high-lighted from above, offer compelling display space, provide interesting breaks. Glass shelving amplifies the distribution of light to provide an economical two-way lighting effect, approximate silhouette seeing and provide plenty of light for foreground ceiling delivery.

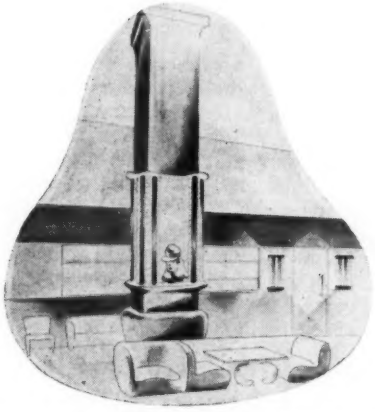




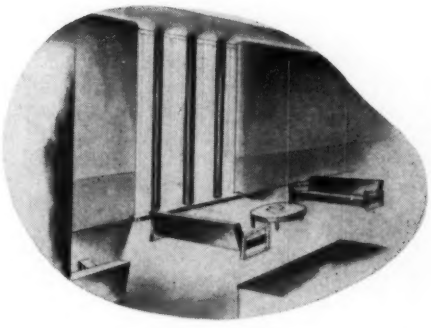
Above the fountain is a prescription gallery with ample shelf and work room for the modern pharmacist. Indirect lighting units recessed in the top of storage cabinets reflect diffused lighting for the careful computing essential to prescription business.

and General Electric Company Lighting for Postwar

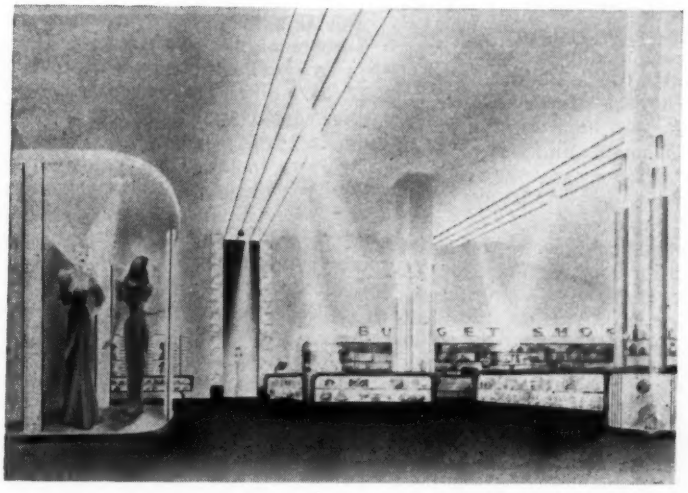
Immediately upon completion of the plan, all essential data will be released to architects, contractors, utility and lighting men. Coordination of the activity is in the hands of the Lighting Equipment Promotion Committee of the General Electric Company's Lamp Department in Cleveland.



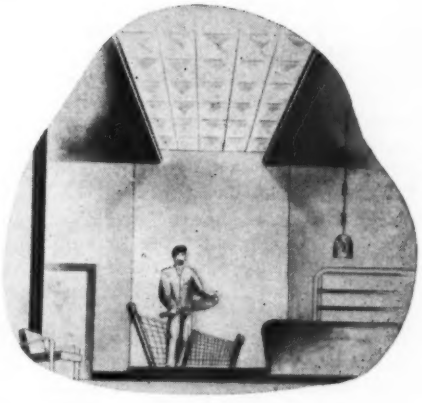
Here structure provides light and columns furnish support and decoration as well as an opportunity for display. Behind configurated glass panels cool fluorescent lighting silhouettes occasional displays in lounge and other similar store areas. The whole display becomes a lighting unit for under-illuminated no-traffic avenues.



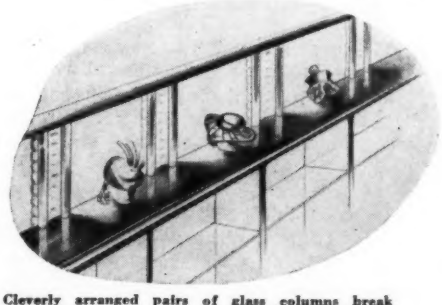
An interesting artificial window or curtain of light, accented by three darkly dramatic perpendicular columns, breaks the monotony of an otherwise barren wall. Shielded fluorescent has been cleverly used to form an attractive island of comfort in a long department store corridor. Thus a utilitarian arrangement yields added illumination and performs an essentially structural servic.



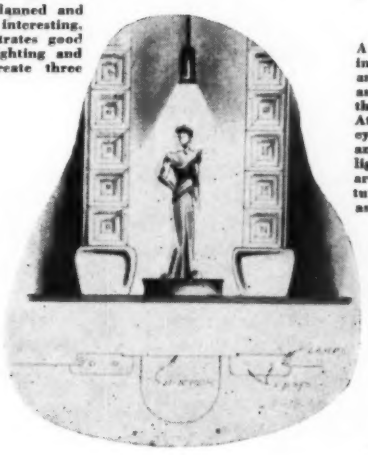
As a medium for expressing his merchandising ideas Egmont Arens has planned and arranged this medium department store, designed the detail of a number of interesting, attractive and practical applications of light-for-selling. His sketch demonstrates good use of such established fundamentals as silhouette seeing, artificial sky lighting and curtains of light. He makes structure provide light and uses it to create three dimensional atmosphere.



Here is indoor daylight from an artificial skylight. Illuminated by daylight fluorescent lamps, this lighting unit ends parades to doors or windows. The size of the light source and the low-brightness of fluorescent lamps make the display a natural focal center while it furnishes ample illumination for a far larger floor area.



Cleverly arranged pairs of glass columns break the pattern of a series of opal glass reflectors to create silhouette seeing, add drama to the display of sheer materials.



A combination of mirror incandescent spot-lighting and fluorescent makes this an interesting example of three dimensional seeing. At a level normal to the eye, this display is framed and illuminated by the lighting units, a large-area, low-brightness picture comparable to the sky as seen through window.

Advantages for Industry in "Three Dimensional Seeing"

By E. W. Winkler*

TO THE illuminating engineer the term "Three Dimensional Seeing" is the name applied to a new theory of lighting in which the quality and quantity of light and the color of objects are blended to produce three dimensional effect. Former theories of illumination and practices have in general considered the quality and quantity of light and the reflecting characteristics of walls and ceilings. The new theory includes all of these factors plus the addition of color to machinery and equipment in such a way that danger zones are highlighted and visual efficiency is improved.

This theory of lighting is comparatively new. About twelve years ago workers in a shoe factory complained of headaches and blind spots. An executive of the company, while watching a man at work on a black shoe in a black painted machine, suddenly noticed that there was no contrast between the shoe and the machine. The dark surfaces made seeing difficult. Acting upon impulse, he told the operator to paint the machine with a more pleasing color. What color the worker selected was not recorded, but evidently it was attractive because in a short time the shoe factory blossomed forth with a varied assortment of colors as other workers followed suit. The colors gave a better contrast between the shoe and the working parts of the machinery. As a result, the accident rate fell off 70 per cent, production increased, there was less fatigue and fewer seconds.

The average well-lighted textile mill presents the same problem. Looms and other equipment are usually painted black, dark green or deep grey. There is little contrast between moving parts and stationary parts, and danger zones are not highlighted with colors. If painted at all, the walls and ceilings are usually painted a glaring white. In the average mills this lack of contrast on machine surfaces, coupled with a uniform white or grey from above, will cause eye strain, headaches and fatigue. When the general illumination is low, the combined effects of insufficient light and lack of color contrast may decrease production by a surprising percentage. Likewise, the possibility of accidents is high.

What Is "Seeing"?

Seeing is the receiving of impressions transmitted to the eye by light waves, and from the eye to the brain by nerve impulses. This paper considers only the first part of this definition, because the quality and quantity of the light reaching the eye can be controlled by the illumination engineer. The act of seeing involves many factors such as the recognition of outline and size; of form and detail; the perception of light and shade; speed of seeing in the case of rapidly moving objects; the contrast of the object with respect to its immediate background and more distant surroundings; the color of the object; and both direct and reflected glare. In addition there are some psychological factors that should not be overlooked.

The influence of illumination on each of these factors must be studied separately. The light that reaches the eye and produces the sense of sight is the light reflected from the object in question. This reflected light will be influenced by the type and position of the light source, the color of the object and contrast with its background, and the quantity of light falling on the object.

The fact that the human eye can see under a wide range of quality and quantity of light does not mean that the eye can see efficiently under such varied conditions. Recent investigations reveal that there are certain minimum intensities below which eye-strain and fatigue are quite serious and have pronounced effects on the output of the worker.

The threshold limits of lighting for visual efficiency vary with different types of work, but in general they require higher intensities of illumination than lighting authorities have recommended in the past. The theory of three dimensional seeing is simply a scientific study of all of the factors involved in the act of seeing with special emphasis on the use of color to produce contrast and highlight danger point.

Each of the factors that affect seeing will now be discussed with reference to its influence in textile work. Outline and size may be considered with respect both to equipment and to work. Very often sufficient space is not available and this means the crowding of both machines and workers. Here is an excellent opportunity to emphasize outline by the painting of the various parts. Since the eye is naturally attracted to the brighter points, the painting of danger areas with light colors will simply improve safety in just about the same ratio that the danger zone stands out from its surrounding parts.

The folder may be considered as an example for this type of safety painting. At the end of each stroke the moving element of the folder comes into close contact with the stationary part. If the color of the stationary part contrasts with the color of the moving part and the average color of the cloth being folded, the danger point will stand out and there will be less tendency to accidents.

The picker might be considered as a second example. While picking is a machine process and involves very little manual work, the controls are usually on the side of the machine and are illuminated from an overhead source, often directly over the machine. Here the location of the light plus the addition of color to the machine and the controls will improve the working area.

The card may be considered as the third example. Here it is necessary to clean certain parts while

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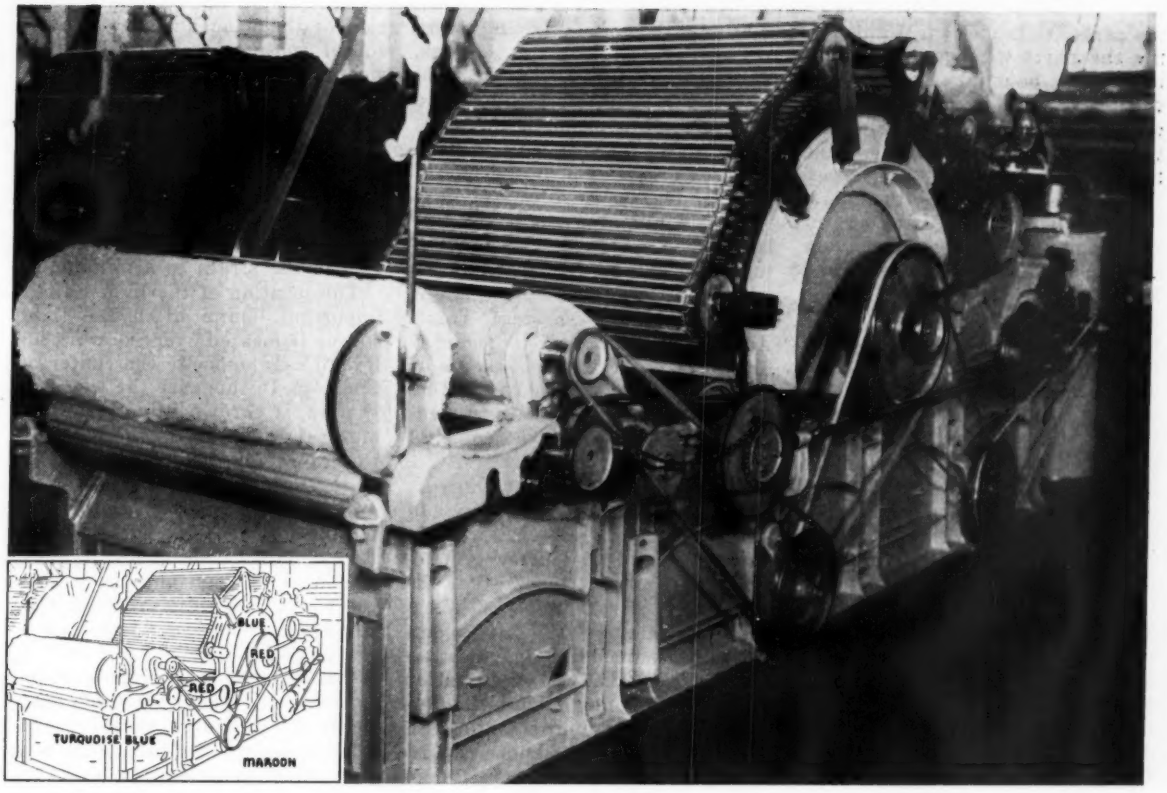
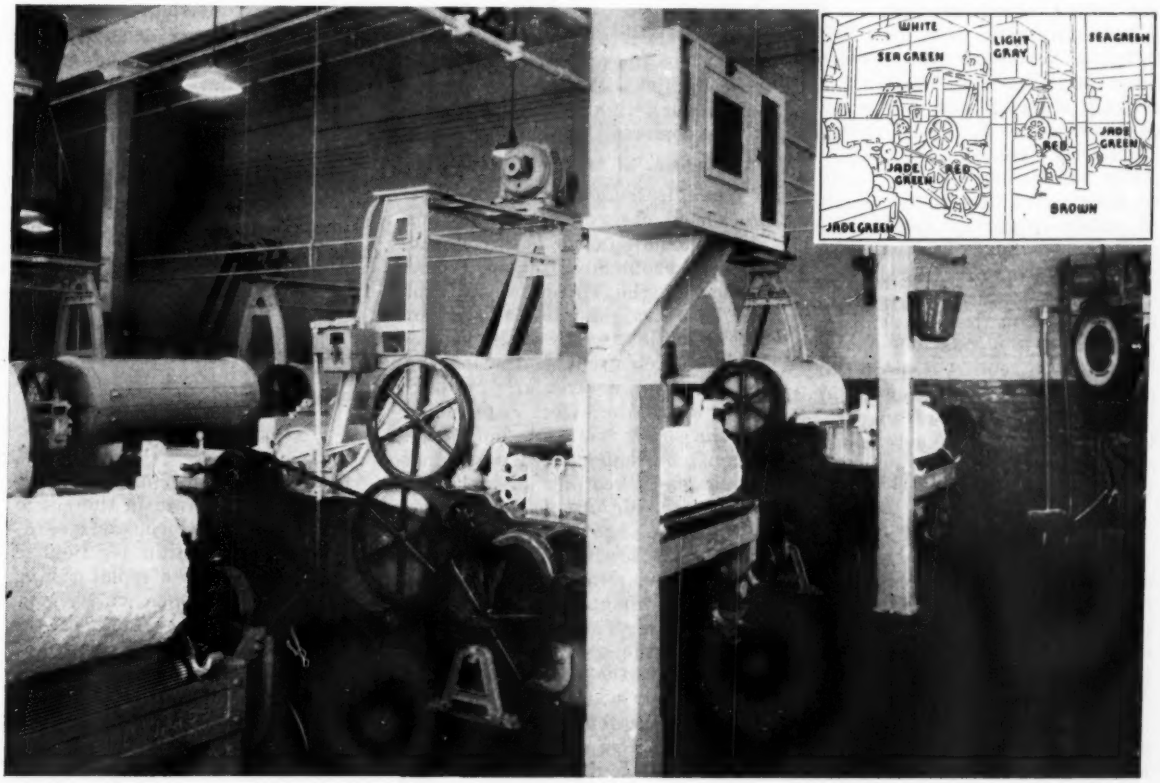
*Assistant Professor of Electrical Engineering, North Carolina State College, Raleigh, N. C. Adapted from a paper presented before the 31st National Safety Congress.



The photographs reproduced on this page show portions of the LaFayette, Alabama, plant of Avondale Mills where color combinations prescribed for three dimensional seeing are yielding dividends in increased safety, decreased fatigue of workers, and increased efficiency. The carder shown above is painted in turquoise blue gloss with the danger areas spotlighted with red gloss. Danger areas on the picker below are identified by red gloss.



the parts are in motion. Highlighting the parts with color will emphasize the boundary line between stationary parts and moving parts, provide more uniform lighting for the worker and definitely outline the danger zone.

In processes such as the handling of raw cotton, breaking of bales and feeding the mixer, very little visual effort is required and hence a low level of illumination is permissable. Between five and ten foot-candles are recommended for this type of work, but this should be uniform and have no extremely bright points to distract the eye. The use of light colored paint in these areas will do much to reduce the visual effort required with the recommended low levels of illumination.

The weave room represents the other extreme in regard to illumination requirements. Here the worker is dealing with fine threads, and very often there is no opportunity to produce a contrast by the application of color, unless light reflected from parts of the machine will produce a contrast. Recognition of form and outline, as well as size and detail, can often be improved by a combination of direct and oblique lighting. A small defect in the material will very often develop into a large one unless it is corrected.

A combination of overhead lighting, movement of the cloth, noise and vibration makes it extremely difficult for the weaver to detect errors. It is believed that a uniform general lighting of about thirty-foot-candles, combined with about fifteen foot-candles of oblique lighting coming from the side at about twenty degrees, will greatly improve the detection of faults and cause less eye strain and fatigue on the part of the weaver. This suggested form of lighting will require a special unit on each loom for the oblique lighting. Many factors will have to be considered to determine if such a plan will be economically justifiable.

Light and Shade

The third factor involved in the act of seeing, the perception of light and shade, is a basic principle in the theory of three dimensional seeing. The quantity of light as well as the arrangement of the light sources will definitely introduce the third dimension of depth into the scene. A good example is any outdoor scene under sunlight. Here the various colors of nature, plus size of objects, light and shadow, give the impression of depth of distance to the scene. Now consider the same scene at dusk. Nothing has been changed except the quantity of light and the nature of the light source. The impression of distance is almost nil because the light intensity has been reduced and the whole sky has become the light source in place of a single point. Anyone who has driven a car at dusk will agree that the factor of safety has been greatly reduced by this change from a three dimensional scene to a two dimensional scene.

In any textile plant the contrast produced by light and shadow can be used to increase safety, decrease fatigue and increase efficiency. The oblique lighting for the inspection of fine work is an example. If natural lighting outdoors is assumed to be the most efficient form, then the illumination of a room for maximum seeing efficiency should approximate outdoor lighting. The factors considered should include sufficient quantity of light, the reflection factors of walls, ceiling, floor and all equipment. The final result should give a restful contrast between light and shadow that approximates the out-of-doors. Much study of the general theory of illumination and of individual areas to be lighted will have to be made before such lighting installations will be common.

Problem of Moving Objects

When it is necessary for the worker to observe rapidly moving objects a new factor is introduced into the problem of seeing. If the motion of the object is uniform and in a straight line, the eye can follow it quite easily if the velocity is not too great. But when the motion is of a circular or vibratory nature, the effort required to see the object is greatly increased. It must be remembered that when a person is reading a book, the eye does not travel uniformly across the page but moves in jumps. Thus when a person is trying to view a moving particle, the eye is about one jump behind the particle. This imposes severe strain on the eye.

In the weave room the weaver must closely watch the surface of the cloth to detect mistakes. The cloth on a high speed loom has a periodic motion due to the vibration of the loom and also a horizontal motion due to the rate of weaving. While this periodic motion may be quite small, it is nevertheless great enough to cause eye strain. Since it is impossible to eliminate this periodic motion, the only practical solution for this problem is to determine the right quantity and quality of light to reduce the strain to a minimum.

The location of the light unit is important. Quite often the light source is located over the work alley directly opposite the center of the loom. In this case the weaver's shadow is thrown directly on the cloth, thus adding to the difficulties of seeing. The ideal location of the lighting unit is directly over the loom, and for uniform illumination the light emitting surface should be large. Fortunately, the ideal location and the desirable size of the unit are such that the maximum output of the unit is utilized.

Reference has already been made to the advantages of using contrasts of colors to reduce fatigue and eye strain. There is a psychological aspect to this idea that is worth considering. In textile industries a large percentage of the workers are women. Research by the medical profession indicates that in general women are more nervous than men. Likewise, they are more sensitive to colors and decorations than men. Any factors that create mental disturbance on the part of the workers will cut down production and may adversely influence the health. Such things as noise, temperature, degree of humidity and illumination are known to influence mental strain, with a corresponding effect on health and production, including pleasing color contrasts, may have a pronounced psychological effect and indirectly improve relations between management and worker.

Problem of Glare

Glare is probably the most serious factor involved in the act of seeing. Glare has been defined as any brightness within the field of vision that causes discomfort, annoyance, interference with vision, or eye fatigue. It is one of the principal causes of eye strain and is therefore always to be avoided, yet it is one of the most common defects of lighting systems. Glare is objectional for several reasons.

(*Continued on page 42*)

What Plans Can the Dealer Make?

An outstanding appliance merchandiser discusses the plans that the dealer can make now to prepare for postwar sales.

WHAT CAN the electrical dealer do now to get ready for the rush of business after the war? All surveys show that next to automobiles, the public will want to buy refrigerators, ranges, radios, washers and other electrical servants—and they will have the money to pay for them.

Here are some of the answers as seen by W. L. McAllister, manager of the appliance department of Loveman, Joseph & Loeb, Birmingham, Ala. Mr. McAllister has been in the appliance business for about 20 years, first as an independent dealer, and then as manager of a department store appliance department. He speaks with a well-rounded experience in the business.

"First," says Mr. McAllister, "re-examine the location of your store and if it is not in the right traffic spot pick another and move while you don't have much stock to transfer. Remember that what the appliance store needs is floor traffic and that can best be obtained in a downtown location. The first thing chain concerns do in locating a store is to make a traffic count. I am not recommending that the appliance dealer pick the most expensive location, but if he can get next to a traffic outlet that will be to his advantage.

Store Site No. 1 Problem

"In picking a store I would have due consideration for show window space, for storage and for service possibilities. Dealer window displays in the past have not been up to par with other retail establishments. They must take them out of the fly-catcher class and make them pull traffic inside. I would most certainly have service facilities because that draws traffic and it can be made profitable in its own right. Service will continue to be important although naturally sales will come to the forefront.

"Next to the store site, the dealer should determine the type of operation he wants to have and if possible get the framework of his organization together. This might

W. L. McAllister

well include arrangements to engage a sales manager, especially if he is above 38 or draft exempt. The sales manager need not immediately come with the organization but an investment could well be made in him.

"Consideration should be given to details of the sales setup. Is the dealer to have a regular floor man or will his outside salesmen work the floor on alternate days? How many lines is he to handle? Will small appliances play a part in his setup? What finance setup is he to have? What promotions will be undertake?

"The matter of determining the number of lines to be handled is basic and needs to be decided now as manufacturers are already busy appointing dealers. For my part, I favor a limited number of lines, not more than two or three in any one appliance. In this way the dealer will get more help from his manufacturers and distributors, and he may need it later on when the going gets tougher.

"The average dealer doesn't have the capital to handle four or five lines. He just clutters up his stock and confuses his customers, who may want the handle off one refrigerator, the salad tray out of another, etc. In limiting the number of lines, the dealer may lose a little business in the beginning, but this is something he should look at from a long range planning viewpoint. What is his position going to be in the future when he may find himself with odds and ends of several different makes of refrigerators, or washers or ranges on his hands? Certain types of merchandise, like soft goods for example, if bought well, will move over the counter, regardless of how many brands are shown. But electrical merchandise doesn't come in this class. It has to be sold, or at least that was the case in the past.

"Whatever lines the dealer handles, he should carry a wide range of styles, sizes and prices. This is more important than the number of lines. Even back in normal times, the number of walkouts from the average store for failure to have what the customer wanted was considerable.

"In having what the customer wants, I don't mean that the dealer should travel down stream all the time. He definitely should push what is profitable to him and not enter into any competition with the mail order chains or other price cutters. This may mean that he promotes some items he doesn't personally like. He must make a profit or else.

"In the resale of a used appliance, I would figure my usual markup as on new merchandise and not just what I had in it. Say I was trading for a radio which I figured I could resell when reconditioned for $25. I would first deduct my 40 per cent markup, or $10. This would leave $15 and if I figured reconditiong would cost $5.00 then I would allow $10 for the set. Many a dealer dissipates his profits via used appliances on which for some reason he doesn't think he ought to make any percentage.

Influence of Markup

"If in the postwar period, refrigerators carry only 27 to 32 per cent markup, as I am afraid they will, and radios carry a 40 per cent or better markup, then I'd push radios. If in a territory where natural gas is cheap then I think I would handle gas as well as elec-

trical ranges. It is only axiomatic that a dealer must handle what he can sell at a profit. I would handle frozen food cabinets if profitable and not solely for the sake of pioneering a new appliance.

"As traffic is so important to the appliance store, I would arrange to hold a demonstration of some kind once a week. This may be a cooking school, a home laundry demonstration, preparation of a "cold" snack, a television broadcast, or whatever will draw prospective customers. I think also in outside solicitation the dealer should with discretion use souvenirs such as water jars and mixing spoons to draw prospects into the showroom.

"Another thing I would do would be to keep a diary of my business, what promotions clicked, how many people it drew, how many sales resulted. The mind is tricky and I would not depend on it entirely for these details. I would be guided by facts and figures and not impulses.

"Some so-called experts feel there is no longer a field for exclusive electrical shops, that the business will all be gobbled up by the furniture and department stores and chain outlets. But the independent shops have carried a share of the service load during the war and many people will look to them for appliances after the war. I look for independent shops to bloom out again in all their glory after the war, as manufacturers seek additional outlets, but whether they prosper or wither and fall off the vine again depends to a great extent on them.

Postwar Deliveries May Be Slow

"The flow of new appliances will be slow for a period after the war and it will not be so much a matter of salesmanship as getting the goods. It will be necessary for dealers to carry along their service and even to expand it. They will then be in good position to expand their sales operations as the supply of merchandise permits. I look for credit restrictions to be continued for a time, so that financing will not be an immediate problem.

"The dealer, however, must build on a firm basis for the period when merchandise is plentiful and competition for the prospect's dollar is keen. He might as well figure on all types of competition from all types of outlets. Even the builders and contractors will be peddling electric kitchens along with their houses. It is likely that building supply dealers also will be in the appliance business. These and other factors make it important that the dealer do some long range planning and do it now. He can modify these plans as events and his experience indicate, but it is wise to make a start as soon as possible."

Large Washer Service Volume Points Way to Postwar Sales

By Baron Creager

WHEN WAR restrictions began to take major appliances out of the sales picture, management in the appliance department of H. Boedeker & Sons, of Dallas, Texas, concluded that the handicap would not prevent adoption of a policy that would prepare the firm for postwar business.

On the contrary, it was determined that the shortage of washing machines and electric refrigerators could be turned to definite advantage.

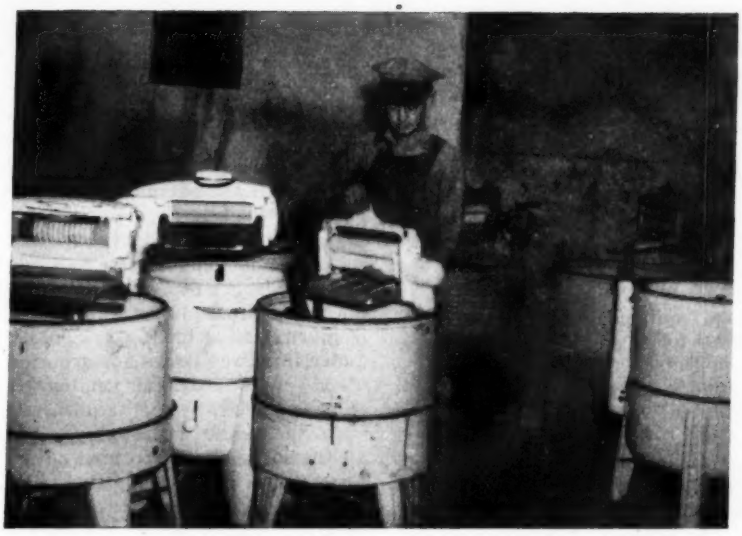
So Boedeker and his appliance department manager, H. R. Livingston, decided to specialize in service of these two major appliances, thus maintaining contacts with users and preparing for the time when such appliances would again be available.

This policy has accomplished the purpose for which it was created —and much more. Repair service on all makes of washing machines and Frigidaires, the only box handled by this company, has exceeded all expectations of Boedeker and Livingston. Service volume runs from $800 to $1,400 a month, handily takes care of the payroll and leaves a margin of profit.

Naturally, the payroll is down about 75 per cent, with elimination of sales personnel. But individual salaries are up, in some cases double what they were, and the department is more than paying its way and storing up information for use in future sales campaigns.

Service volume is divided with approximately 60 per cent on wash-

H. R. Livingston, manager of the Boedeker electric store in Dallas, checks up on his stock of washing machine repair parts. Keeping up this parts stock makes it possible for the company to do its unusually large volume in washing machine repair.



Willis Billiom, of the repair department of the Boedeker Company, Dallas, is shown inspecting one of the many washing machines this firm repairs each month.

ers and 40 per cent on refrigerators. But a washing machine does a heavier job of work and its repair requires a greater range of heavier parts, so 75 per cent of the Boedeker parts space is occupied by washer parts.

Without having any special claim to foresightedness, Livingston relates that he saw the crisis coming in washing machines and anticipated a great demand for service. So his first concern was replacement parts and it is now his policy to maintain his parts inventory at a constant value of approximately $2,500. In the sales field the firm specializes in Maytag washers, but the parts stock includes fast-moving items for practically every popular make of washer.

This parts stock is replenished every two or three months. Liv ingston places a parts order that runs to $400 or $500 every month, but two or three months may elapse between orders of parts for one specific make of washer. He maintains a daily check on the condition of his parts stock, but places few minor orders, except in event of emergency, because parts are much more easy to get in quantity orders.

Livingston's next concern was manpower in the shop, but this was not an acute problem because his shop foreman is a veteran mechanic capable of high production. The ability of this mechanic is more keenly appreciated in view of Livingston's statement that his service volume is satisfactorily kept moving by the one veteran mechanic and a part-time helper. The shop is always well caught up with its work and that is one reason Livingston declines to name the mechanic or otherwise invite competition to bid for this man.

Little Promotion Required

Thus prepared in both parts room and shop, Livingston decided there would be so much demand for service on old washers that special effort to attract this business was unnecessary. This effort is confined to listings in the yellow pages of the telephone directory, but under the classification, "Washing Machines," the name H. Boedeker & Sons" appears six times. Those six listings, one of them a 2½-inch, one column advertisement, appear in columns of the yellow pages that are back to back cn two different pages.

"If owners of old washing machines look in the yellow pages for service," says Livingston, "there is little likelihood they will miss the name of Boedeker. It is freely scattered all through the section devoted to washing machines and I consider that form of advertising largely responsible for our relatively heavy service volume."

Remarking that washing machine service is seasonable, Livingston likes to refer to December of 1943 as an example of monthly service volume.

"It was a low month," he says, thumbing through the service record book, "but we had 85 washers for overhaul."

He takes a Maytag washer as an illustration of the volume possible. On a Maytag the ceiling price for labor and paint necessary for an overhaul is $14. On 85 washers that is $1,190. To that is added the parts required, and the figure would necessarily fluctuate for each job.

As a result of this service, Livingston has five books full of names, addresses and telephone numbers of owners of old washers. Some of them will move away and others will change addresses, but a majority of them are permanent citizens and they will be in the market for new washing machines when the machines are available. Through the names and addresses in those books, Livingston expects to realize dividends on service performed. And because he was prepared where many others were not, many who benefitted from his service, but whose addresses will be incorrect after the war, will gravitate back to the Boedeker store.

Livingston has another book that illustrates how such prospects for postwar business may be accumulated. In this inexpensive, paperbound volume are the names of 1,500 people who made telephone inquiries about washer service. When actual service produced an abundance of names of prospects, this book was discontinued, but in one month — January, 1943 — 150 names with addresses were recorded.

Why does Livingston take such pains to gather names of prospects for after-the-war washer sales?

Because he is instinctively a washing machine salesman.

Boedeker wondered if Livingston was right—if there would be a great demand for washing machines — when Livingston bought four carloads of washers back in 1941. He bought as many washers as he could get, from every source he could find and in 12 months of 1941 and 1942 sold 800. He sold them all over Texas, in Oklahoma, Louisiana and even in Nevada. In that case a Nevada citizen was traveling south, made inquiry wherever he stopped and was told in Fort Worth, Texas, that Boedeker had washing machines.

"Why," says Livingston, "four carloads was just a normal five to six months' supply."

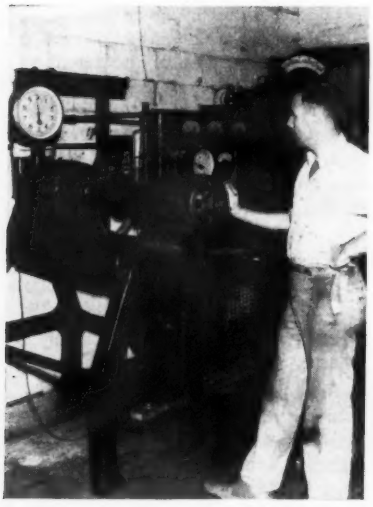
Motor Shops Have Vital Role In Country's War Effort

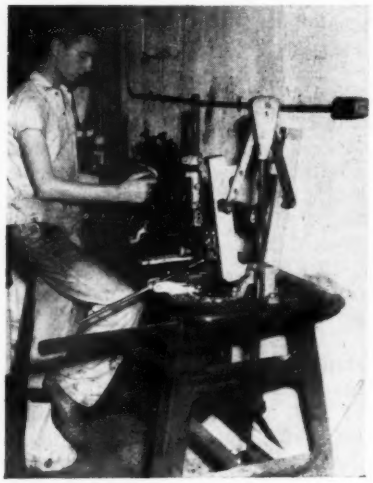
By Harrie H. Bierman

THE BROADENED employment of electrical power throughout the South has brought into increasingly sharp focus the vital role played in the power picture by competently-managed, well-equipped motor repair shops. And, now that new motors have become harder and harder to get, the importance of efficient servicing for present equipment looms larger than ever.

Outstanding in handling the job of keeping South Florida's electrical power-units turning up their required number of rpm is the Peninsular Armature Works of Miami.

Occupying a 35 ft. by 85 ft. concrete-block structure at 1653 North Miami Avenue, Peninsular acts as servicing agency for Century electrical equipment and Porter-Cable power tools, such as saws, sanders, floor-finishing apparatus, surface grinders and milling machinery.





O. A. Clot, owner of the Peninsular Armature Works, of Miami, demonstrates the application of the dynamometer-tachometer built in his shop from salvaged materials. At right, one of the coil winders is operating the Browning spreader which handles coils up to 48 inches. Although the Peninsular Armature Works is now able to handle repairs on motors up to 1,000 horsepower, it got its start in the repair of small high-speed motors. The company's postwar program will include small motor repair for South American customers to be served by air transportation.

"In many armature shops," explains O. B. Clot, owner of the organization, "the repair of small, high-speed motors rates as a first-class headache. However, out of our experience, I would say that failure of such motors to stand up, after they are rewound, is traceable nine times out of ten to the type of varnish used. The remaining failure-percentage usually is due to the employment of hand-winding methods."

Varnish trouble, Clot points out, stems from the use of a varnish which is not sufficiently heat-resistant. After a considerable amount of experimentation, he finally found a varnish that is highly satisfactory on motors operating at speeds up to 30,000 rpm.

Proper baking, of course, is important, too. Clot's method for varnishing and baking is this: The rewound armature is varnish-dipped, commutator end down. It then is baked in that position at 220° F. for approximately eight hours. Removed and cooled, the armature is dipped, commutator end up, and baked in this position at the same temperature and for the same length of time. Following the above procedure, the armature is given a final baking at 300° F. under infra-red lamps for a period of 1½ to 3 hours, depending on its size.

As the result of this processing, all the solvent is evaporated out of the varnish, leaving only the resinous base. And the latter is metal-hard. In fact, when struck with a steel rule, it gives out a metallic ring.

Dipped in a varnish compounded with a solvent, which evaporates less readily, or when insufficiently baked, the varnish has a tendency to soften under the heat generated by high-speed operation. The centrifugal force of the latter, says Clot, then will throw the coils out of position, shorting the armature.

During the past seven years, the shop has turned out something like 6,000 of these rewound, high-speed armatures—and at a good profit. Clot, himself, made the machine on which they are wound in about three hours' time out of salvage material. The average winding time for an armature from a ½ hp to 1½ hp motor is 25 to 30 minutes. Clot has wound them in 17 minutes.

When building construction was at its peak in South Florida, the firm kept two men on this type of work exclusively. Now, the demand from that particular source has fallen off but over-all volume on high-speed armature winding still is good.

While Peninsular got its start as the result of repairing small motors by no means does it major on them. Clot repairs and rebuilds motors and generators up to 300 hp. However, his shop is equipped to handle units as large as 1,000 hp.

Work done includes that on both a-c and d-c power units for commercial, industrial and marine use. And, naturally, during the past two and one-half years the concern has handled a sizeable repair and rebuild volume—much of it on "high priority" marine jobs — for the armed forces.

Often in an "emergency," Penin-

sular can supply out of inventory for temporary replacement a rebuilt unit of the right type and horsepower to fit the customer's needs. Peninsular now has in its revolving stock approximately 200 motors—ac- and d-c—of various types, ranging from 1/6 hp to 75 hp. This stock has been built up as the result of outright purchases and "exchanges."

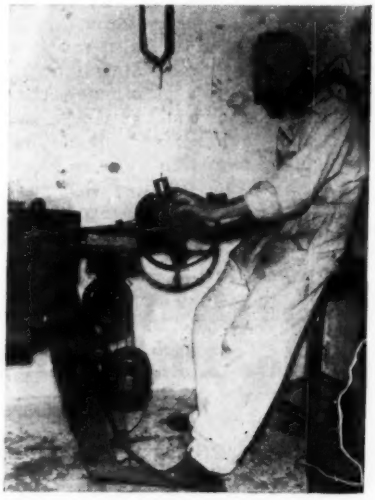
For instance, a few years ago, a small industrial plant moved to South Florida, and brought with it a considerable number of d-c motors, ranging from 1/4 to 5 hp. These the company exchanged with Peninsular for a-c equipment. Rebuilt, these units proved later to be particularly useful for several highly essential applications.

Peninsular does what amounts to a nation-wide business on motor and generator rebuild work and on the sale of rebuilt motors. The concern has shipped the latter to points as far distant as Montana. And only recently, Clot sold a rebuilt 32-volt, d-c generator to a customer in Boston.

In addition to motor and generator work, Peninsular rebuilds and repairs switchboard equipment — switches, indicators, transformers and the like. The shop has on hand for resale, also, a limited quantity of reconditioned apparatus of this type.

Clot has a nice, well-arranged replacement parts inventory. It includes replacements for repairing portable power tools and many parts items, such as bushings, bearings and brushes, for the larger power units. The shop can, and does when necessary, make up some types of parts. For example, it makes up out of sheet or block material any needed type of carbon brush.

Peninsular is well tooled for the work it does. Its machine shop equipment includes a 20-ton hydraulic press, portable and bench-type grinders, drill presses, oxy-acetylene and arc welding apparatus, a milling machine for cutting keyways, a metal shaper and two lathes with all necessary attachments. The larger of the lathes has a 14½-inch swing and an 8-foot bed. The other has an 11-in. swing.



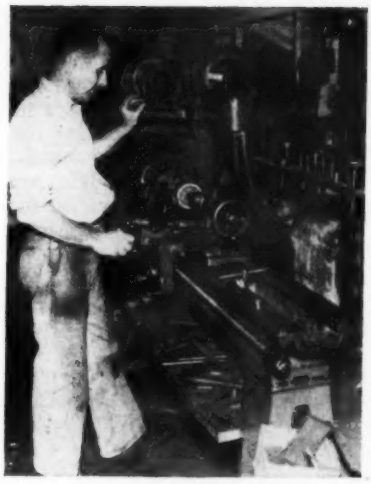
The machine winding of small armatures is an important factor in the success of this service organization.

A Peninsular workman inserts machine-taped coils. The shop performs all types of power unit reconditioning.

The electric welders are of 100 amp. and 300 amp. capacity, respectively. The 300 amp. unit Clot constructed himself, using parts from a smaller-capacity machine.

Much of the armature shop's tooling is home-built. Among such items are a large-armature winding machine, a spreader of 36-in. capacity and a coil-taping machine. The latter Clot constructed out of scrap in one day's time. He has, also, a 48-in. spreader of standard manufacture.

The home-made apparatus of which Clot seems proudest is an electric dynamometer having a testing range of 1/6 to 10 hp. An attached tachometer — also home-built—records the rpm of the unit under test.



Proper tools and equipment is essential to the motor repair shop. This is one of the two lathes in the Peninsular Armature Works motor shop.

Provided with an adjustable-height platform for the unit being checked, the standard on which the dynamometer equipment is mounted originally was part of a discarded generator test-set. Free-turning, the generator portion of the apparatus is supported by a ball-bearing pedestal furnished at either side with an arm ending in a metal sector which forms part of a circle five feet in circumference.

Attachable at will to either sector is a weight scale, registering from 0 to 30 pounds. The motor under test is connected to the dynamometer-generator by a partly rigid, partly flexible arrangement, consisting of a three-jaw, lathe chuck and a double universal joint.

Having a horizontal indicator (hand made, incidentally) reading from 400 to 3600 rpm, the tachometer instrument is geared to the dynamometer-generator shaft. Directly below the rpm readings on the indicator are inked-in figures computed on standard horsepower-formula factors. To get developed horsepower it is necessary only to multiply the indicated figure by the weight shown on the scale.

Adjacent to the dynamometer equipment, a test-board provides facilities for making other tests on single-phase, two-phase and three-phase units. Besides fixed shop-installations, Peninsular has portable a-c and d-c checking instruments, such as voltmeters, ammeters, ohmmeters, frequency-meters and tachometers.

In one way or another, Clot has

reduced his war-created business problems to a minimum. Since he operates no pick-up and delivery trucks, gasoline and tire rationing troubles him little. Small units he handles in the light passenger car he uses as a "service" vehicle. Larger units of local origin are brought to the shop and called for by the customer. Out-of-town jobs, incoming or outgoing, are moved by truckmen.

"Of course," says Clot, "we have a 'manpower shortage.' The armed services have taken some of our men. But, somehow, we have managed to get by without having unfinished work pile up on us too badly."

Besides Clot and a woman bookkeeper, Peninsular's personnel now consists of eight men. Clot has employed women for armature winding, and found their work entirely satisfactory. However, in the local labor market he also found himself unable to compete on wage scales with war industries which pay higher prices for easier work.

Technical School Supplies Help

Most of the men in Peninsular's present force are over draft age. To supplement their output on certain types of work, Clot employs advanced students in the motor repair training course at the County's Technical High School.

So far, this plan has worked out very well for all concerned. The trainees are intelligent and conscientious. And, under Clot's supervision, they turn out excellent work — especially on the smaller units. In addition to being paid for their time, they get credit on the school's "shop-work" record for the hours actually put in at Peninsular.

Clot, himself, handles all outside service calls and other out-of-shop business. In addition, he puts in considerable shop time doing actual work, as well as supervising. Starting Saturday noon, when his plant closes officially for the week, Clot does over the week-end his "catching up" on unfinished orders, particularly on the more complicated units.

Peninsular does no routine generator, motor or switchboard installation work. However, on occasion, the shop has turned out some unusual electric jobs. In one case it designed and built an electrically-powered conveyor system for a local fruit-packing company. In another instance, it constructed an electrically-operated "rabbit", as emergency apparatus for a South Florida grayhound-racing track. This device still is in operation.

As a part of his postwar planning, Clot has drawings for several electro-mechanical devices he hopes to build and market, when the supply of material and manpower again become normal. Included, also, in his after-the-war program is the development of a Central and South American small-motor-repair clientele to be served by air-transportation.

Mr. Clot first came to Florida in 1925 and went to work for the Miami Armature Works, owned then by E. B. Grutzbach.

About 5 years later, Grutzbach sold out his business and retired, and Clot transferred to the Miami Street Railway division of the Florida Power and Light Company. There he had charge of the repair and maintenance of street-car motors and of the electrical equipment on the company's gasoline-electric busses. At that time, FPL was operating a number of commercial ice-making plants in various Florida cities. Clot serviced the electrical equipment in these plants.

While he was with FPL, a friend came to Clot's home one night, and asked him to repair the motor on a portable power saw. Out of this incident grew an idea.

There was a large and constantly-growing quantity of portable, electrically-powered tools in use in the Greater Miami area. Moreover, there was no regular serving agency to take care of motor trouble on this kind of equipment. So Clot began to service portable power-tool motors at night.

Before long, volume expanded to the point where he found it necessary to open a small shop, centrally located. Daytime operation, too, was advisable. In addition, there was work on larger-size electrical power units to be had. Therefore, Clot invited his former employer, Grutzbach, to join him in establishing Peninsular Armature Works, as a general motor repair business.

The partnership continued until the first of this year, when Grutzbach sold out his interest and again retired, leaving the conduct of the firm's affairs in the capable hands of Clot, as sole owner.

Electrical Committee Amends Code, Plans 1945 Revision

THE EMERGENCY Committee of the Electrical Committee, of the National Fire Protection Association, held its sixth meeting on March 15 for the purpose of adopting additional Interim Amendments to the National Electrical Code and to discuss other Code matters.

Of particular interest was the action of the committee in announcing that a meeting of the complete Electrical Committee would be called late in 1944 for the purpose of providing for a 1945 edition of the National Electrical Code.

Following are the Interim Amendments to the Code which were adopted, effective April 1. It is not expected that a new supplement to the Code will be issued.

Interim Amendment No. 74

Table of NOTE following paragraph (c) of section 2203 (Interim Amendment No. 74 approved September 10, 1942). Change last two items of table to read:

"6 to 40 ranges.....20,000 watts plus 1,000 watts for each range over 5

"41 ranges and over..55,000 watts plus 750 watts for each range over 40."

Interim Amendment No. 69 Withdrawn

This amendment is a note added to section 3005 of the 1940 National Electrical Code, as approved August 4, 1942, and revised September 10, 1942.

Delete the note, thereby withdrawing the recognition of conductors with emergency insulation (Type EI) when used as ungrounded conductors. Withdrawal includes the recognition of conductors with this emergency insulation with lead-covering, Type EIL.

Interim Amendment No. 85

Amend paragraph (a) of section 4503 by substituting the following for the entire present text of the paragraph in the 1940 Code.

a. **Dry-Type Transformers** — Dry-type transformers shall conform to the following:

1. **Minimum Space Separation**—An air space of not less than 6 in. shall be provided between transformers and between each transformer and adjacent surfaces other than the surface upon which the transformer is mounted.

2. **Units of 100 KVA or Less**—Units of 100 kva or less shall have a separation of at least 12 in. from combustible material unless separated therefrom by a barrier of noncombustible, heat-insulating material, or unless of a rating of 600 volts or less and completely enclosed except for ventilating openings.

3. **Units Over 100 KVA**—Units of over 100 kva shall be installed in a transformer room of fire-resistive construction unless they are constructed with Class B insulation as defined in AIEE standards and are separated from combustible material not less than 6 feet horizontally and 12 feet vertically. These space separations may be reduced by the use of an effective barrier of noncombustible, heat-insulating material.

Section 4551—Add the following sentence to the present text:

Section 4551—Amend by adding the following sentence at the end of the section. "If of the dry-type and insulated with Class B insulation, the class of insulation shall be indicated on the name plate."

Section 4552—Amend by substituting the term "Dry-type" instead of air-cooled transformers as the caption and substitute the following for the second sentence of the present text.

Section 4552 — Amend by using the term "Dry-type" instead of "air-cooled" in the caption and text, and replace the second sentence with the following: "Dry-type transformers shall be provided with a case or enclosure made of noncombustible moisture-resistant material and which will provide reasonable protection against the accidental insertion of foreign objects."

Interim Amendment No. 86

Revision of Interim Amendment No. 70, new Article 670 approved August 4, 1942; amend by substituting the following for the present text of section 6721.

Section 6721. Sizes Permitted — Branch circuit and control conductors in or on a machine shall not be smaller than No. 14 except as follows:

a. **Copper-Clad Steel Conductors**—No. 16 solid copper-clad steel (molten-welded to core), Type SN insulated, having a minimum conductivity of 30 per cent of the corresponding size of copper wire may be used for fixed wiring.

Note: For the purposes of this subparagraph, the current-carrying capacity of No. 16 copper-clad steel, SN insulated, conductors shall be seven amperes.

b. **Conductors in Flexible Cable**—Copper conductors in flexible, nonmetallic, multi-conductor control cable to continuously moving parts may be No. 16 if all such conductors are insulated for the maximum voltage of any conductor in the cable.

c. **Electronic and Precision Device Conductors** — Copper conductors to electronic and precision control devices may be No. 20, except if pulled into raceways they shall be not smaller than No. 18.

Daily Ads Used Effectively To Build Service Volume

EVERY day the newspaper readers of Little Rock, Ark., see the attractive one-column advertisements of the Electric Construction Company, which remind them that patriotism and wartime necessity demand the conservation of electrical appliances and fixtures.

And every day a long string of customers come into the attractive showroom and contracting headquarters of this dealer, bringing their inoperative vacuum cleaners, irons, toasters, coffee makers, mixers, hair dryers, and other small household appliances. Although the dealer has two pickup trucks that are kept busy, more repairs are brought in by the customers. That is because of a frequently-used suggestion in the one-column ads:

"Bring your appliances to us for prompt and more economical service."

CONSERVE
Help Burn Tokyo
Keep that toaster in smooth working order and never serve burned toast.
BRING your appliances to us for prompt and more economical service.
Electric Construction Co
317 Main • Ph. 6127

This is typical of the effective small ads used to bring in electrical appliance repair business.

Fred C. Bragg, owner of the Electric Construction Co., of Little Rock, has moved his desk from the display room to the repair department. Repairs, he says, are the lifeblood of the contractor's business volume now.

One skilled service man devotes all of his time to repairing small appliances. Although he is usually a day or two behind in his work, he contrives to give prompt service in emergencies.

These drop-in customers must pass through the gift department, which now occupies the entire front section of the store, and many of them make purchases. Established originally to attract women customers and to help pay overhead, the gift department is now an important part of the dealer's volume. Fred C. Bragg, owner, said that a well-managed gift department should not be considered as substitute merchandise, but as a logical and profitable branch of the electrical fixture show room.

Repairs to house wiring and fixtures are building so much new volume that a new, completely equipped service truck is being added to the one now on duty. These trucks are practically repair shops on wheels, taking all needed tools and repair parts to the job.

The small one-column advertisements, tying in with the conserva-

tion principle, have been particularly effective. They employ such timely phrases, as "Help burn Tokyo," and "Don't let worn or damaged electrical appliances sabotage your household efficiency." The schedule for daily coverage is made up in advance, so that the two newspapers will always have fresh copy, with few duplications. Mr. Bragg pointed out that small display space delivers as much sales punch as larger space when good display is used and the message is new and fresh, with as little repetition as possible, except in the general sense of hammering away on the same general idea from different angles.

While newspaper advertising is used for repairs and gifts, direct-mail advertising, in the form of letters, keeps up the contracting end. Twice a month over 300 letters are sent to cooperative associations, making an appeal for outside wiring jobs. At this time the Electric Construction Company is furnishing labor and trucks on a rural electrification job that runs to $100,000, including material and supervision. Now that defense contracts in this territory are about completed, the contractor must look to rural electrification for volume, Fred Bragg said.

"Every outside rural job gives us a potential future customer for the inside wiring that will eventually come," he said. "We're keeping a file for future selling."

The future is never forgotten in current efforts to build volume. The service men who go to the home to repair the wiring or fixtures always place the dealer's sticker on the outlet box. Future volume was considered when the men themselves were employed. Fred Bragg will not have an employee who is not courteous and neat, no matter how efficient he is.

"The service man is almost the only contact hundreds of our customers have with the store," he said. "He must be a good representative for us."

Because the gift department is such an important element in this contractor's current volume, being promoted together with practically all merchandise and service, a brief resume of its management is in order. Fine American glass is featured above everything else. That is because it is available in good variety, now that so many Czech refugees are over here and are able to create objects as beautiful as imports. Along with the magnificent displays of American glass in the store are shown sparkling crystal chandeliers, which this dealer has always featured. Some of these chandeliers are priced at $200 and $300, and all of them are expensive. But they sell to those prosperous customers who buy the better gift items.

The manager of the gift department makes two buying trips a year, going to New York and Chicago. While the wants of "the carriage trade" are given paramount attention, some lower-priced merchandise is bought to attract that long stream of customers coming into the store with their small appliance repairs — little 50-cent bottles of sachet and one-dollar what-not trinkets.

Many a small sale, from 25 cents to one dollar, is made from the tallow candle and greeting card display which now occupies a prominent place in the show rooms of the Electric Construction Company.

America Unlimited!

(Continued from page 8)

we will have merely an armistice, that peace can come only when people have the mind and the will for peace; and that will take a change in our thinking, a change in our conception of the world of tomorrow.

We must understand that one of the principles of that concept of the world of tomorrow is greater productivity, not only on the part of the American people but on the part of all peoples of the world, and that we in America must use our great position as the greatest creditor nation in the world, we must use our position of strength and leadership to assist in the industrialization and to assist in the raising of the standards of living of other peoples of the world, not through a system of philanthropy, not through a system of giving things, not through a system of attempting to paint the toenails and to marcel the hair of the so-called backward peoples, but by giving those peoples an inward impetus upwards by our own leadership in America.

No one can defeat America except the American people. We are the strongest nation in the world because we have the greatest productive capacity, the greatest financial strength, and the greatest military capacity. If we only understand that military power and strength, if we only understand our position and realize in the process of our thinking the opportunities, then our goals for the benefit of our own people and for the benefit of other peoples can be attained.

There never was a time when people and geography were placed in such favorable circumstances together. Have we the ability to meet the opportunities that lie ahead? Have we the ability to temper our souls and to raise our spirits to the magnificent opportunities, to the goals, the horizons, that are within view of us after this war? If we do have, I can tell you this evening that this is "America, Unlimited."

George Chapman, William Chapman, and James Godwin are the mainsprings in the Chapman Radio and Television Co., of Birmingham, where production line methods have been installed which enable the company to handle up to 900 radio repairs per month. The company expects to go back into selling after the war and, as the name indicates, they expect to have a hand in the sale and service of television as soon as it gets 'around the corner.'

Production Line Methods Used To Speed Radio Repair Work

By Geo. H. Watson

HANDLING 600 to 900 radios per month is a job that reqires production line methods in the shop of Chapman Radio & Television Company, Birmingham, Ala.

Besides repairing this number of sets, it is a big job to keep track of them in the shop and locate them when the owners call. In order to have some system about this, a number of shelves were built in what was formerly the radio display room. Each shelf is numbered and when a radio is fixed the number of the shelf on which it is placed is marked on the ticket. This makes it easy to find the radio desired.

Each radio coming into the shop is also given a number. The ticket also shows the name and address of the owner, but the set is routed through the shop by number and the customer is asked to call for it by number. Formerly sets were sent through by owner's name, but this often caused confusion, especially when a person other than the one leaving the set called for it.

When an owner leaves a set to be repaired, he is encouraged to give a go-ahead order on it. However, if he wants to be called as to the cost of the repair that will be done also. No sets are tested while customers wait; instead the set is allowed to take its place in the production line. When a set is tested a record is entered in the record book beside the assigned number of the radio as to the work required and the cost as for example: "3 filters, repair dial, pilot light, $7.50." In practice the shop waits until the customer calls rather than call him, as he may be out. When the owner calls, whoever answers the telephone can give him the information as to the repair since it is entered in the counter book. As the radio finally goes back to the owner, it bears its shop number, marked in blue crayon on the back, so that the concern can look up the record and determine what work was done at any time.

The same system is applied to actual work at the repair bench. One man tests the set, a helper gets it ready for repairs, and three mechanics fix them. The helper does most of the reassembling after the set is repaired. In this way mechanics do nothing but repair sets and no time is lost with preliminary details. Others than the regular mechanics attend to such details as answering the telephone, making out tickets, and delivering sets to customers.

Long hours of operation are observed by this concern in an effort to take care of the trade and keep the volume of radios moving through the shop. It opens from 8 A. M. to 6:30 P. M. then reopens again at 7 P. M. and remains open until 11 P. M. Men are working during all these hours. It closes its doors on Wednesday afternoon in cooperation with a city-wide closing program, but keeps on working. Some work is done also on Sunday. Even with these long hours the concern was at one time 10 days behind with its work, but as a result of improved methods now gets radios back to owners in 3 to 7 days.

At the beginning of the war the Chapman Company had a stock of some 10,000 tubes. This reserve has been gradually depleted although new supplies have been bought as available. It has been necessary to make adapters for hard-to-get tubes, and a good many 7-volt tubes are being used in lieu of 12-volt. Required parts and tubes are laid out in advance as far as possible for the jobs in hand, so that there will be no delays while waiting for orders to

(Continued on page 46)

Shelves that once carried new merchandise are now used for storage of radios after they have been repaired and until owners call for them.

How to Service Sealed System Mechanical Refrigerators

This is the second part of an article which began in the April 1944 issue. It describes the tests and repairs that can be made on sealed unit refrigerators by the average sized service shop.

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ELECTRICAL service for the sealed unit refrigerator system can be handled by a few simple tests.

Motor failure can be caused by: (1) Motor windings grounded, (2) Motor windings open, or (3) Motor windings shorted.

A complete check of the electrical system requires the following equipment: (see Figure 1) test lamp, test starting leads, wattmeter.

Method of Making Tests

It is first necessary to determine whether the failure is in the motor sealed inside the unit or in the wiring outside the sealed unit.

Remove the ice trays from the cooling unit. Start, with the cabinet and refrigerating system at room temperature. Connect a wattmeter in the motor circuit, using the test starting leads for starting. Start the unit and allow it to run for ten minutes. If at the end of this period a wattage in excess of the limit set by the manufacturer is indicated, the motor should be considered out of order. In this case the following tests should be applied.

(1) Using the test lamp, plug into a convenient outlet and ground one test point on the compressor housing. Place the other point successively on all three motor terminals. If the lamp lights, a grounded motor winding is indicated.

(2) Using the test lamp, plug into a convenient outlet. Place the test points on R and B, B and W, and R and W, Figure 1. If the lamp does not light in each case, an open winding is indicated.

If the above procedure indicates that the compressor motor is all right, the following procedure will locate the electrical trouble:

(A) Thermal Overload Open. Use test lamp with the terminals shorted. Plug in the unit service cord and close the temperature control switch. Place the test lamp points on the relay terminals L and 2 and then on L and M. If the lamp lights on the first position and not on the second, the thermal overload is open.

(B) Relay Contacts Stuck Closed. Use the test lamp with terminals shorted. Plug in the service cord, place the test points on terminals S and 3 and close the temperature control switch. If the lamp remains brightly lighted for five seconds, the relay contacts are stuck closed.

(C) Relay Contacts Fail to Close. With the relay contacts stuck open, the motor will not start when the procedure in (B) is followed and the lamp will not light.

(D) Starting Relay Opening too Soon. Follow the procedure outlined under (B). If the relay contacts are opening too soon, the motor will fail to pick up the load and will stop. (This may be due to improper unloading.) The lamp will go out, the current will continue to flow through the thermal element and the overload will open. After a period of time the thermal element will cool, allowing both contacts to close, and the above operation will begin again. If the unit does not start after five or six operations of the overload, the timing is too short.

(E) Broken Wires. Remove the lead wires from the compressor. Use the test lamp plugged into a convenient receptacle. In succession, place the test points in the following positions. Place the tips on L and M, 2 and 3 (thermostat closed), L and S, S and the white lead wire, 3 and the black lead wire, M and the red lead wire. The failure of the lamp to light indicates an open circuit between the points checked.

(F) Thermostat Contacts Open. Previous check under (E) covers this in a check between 2 and 3.

(G) Ground in Wiring. Remove the unit service plug. Remove the leads at the compressor. Plug in the test lamp at a convenient outlet, grounding one test tip to the condensing unit base. Place the other test tip successively on each of the three motor leads. If the lamp lights, a ground is indicated at that point. Reverse the plug in the socket and re-test. Light must light in both cases.

Natural Convection

Many manufacturers of sealed systems employ the principle of natural convection to successfully accomplish condenser cooling. One of the benefits of natural convection is the continued cooling of the condenser on the off-cycle. Most units that are equipped with fans for forced circulation, have the fan motor connected in series with the temperature control and stop when the compressor motor stops. This arrangement presents an obstruction to off-cycle cooling in the form of a non-operating fan and in some cases, a fan shroud. Circulation of air through the unit compartment will continue as long as there is a temperature difference. A comparatively low sealed unit temperature is beneficial in several ways: better motor performance, less super-heating of the suction vapor entering the compressor.

As the condensing temperature is slightly higher during the operating cycle with natural convection as compared with forced convection, there will be a slight increase in current consumption of the unit motor. This is compensated for, however, by elimination of the current which would be consumed by a fan motor; the total kilowatt-hours per month will be about the same.

The duct or stack on the back of the cabinet takes care of the warm discharge air from the unit compartment. Cool air is taken from the floor and passes through the condenser which has a much greater surface area and capacity than the open-type belt-driven units. With natural convection,

---

This article is based on information prepared by engineers of Nash-Kelvinator Corporation.

there is no possibility of fan noise and any service difficulty which might arise from the operation of a fan motor is eliminated.

Changing Systems

In a sealed system, the cooling unit, tubing and condensing unit constitute one sealed assembly. The system must be installed in the cabinet as an assembly and there are many different methods of handling this phase of the sealed system service.

Most sealed system cooling units are installed through an opening in the cabinet back or cabinet top. Usually this opening is plugged with a section of insulation and an inner and outer panel to match the cabinet proper. Ordinarily, the outer section of this plug is gasketed to prevent the entrance of air or moisture to the insulation. Some systems have the tubing installed in the front, behind the door trim.

When handling a replacement, it is usually best to remove the air duct or any tubing channel that particular refrigerator may have. Remove the cooling unit plug (if any) and then the cooling unit hanger bolts. Loosen the thermostat bulb clamp and remove the bulb, then take out the cooling unit. Use caution in handling the tubing so that it does not become badly twisted or distorted. If the condensing unit is bolted to the cabinet base, remove the bolts and then carefully remove the unit. Install the replacement system. Place the system removed in the same crate or container in which the replacement was received.

Repairs in the Field

Before returning a sealed unit for replacement, the service man should make every effort to ascertain that the difficulty is not the result of a condition that can be remedied in the field. Past experience indicates that many sealed units have been returned to the manufacturer unnecessarily. Following are some of the common reasons for returning units that could have been repaired in the field:

"Runs All the Time With No Refrigeration"

Correction: Change relay.

This condition will appear evident when the cold control calls for refrigeration and the relay will not reset to start the compressor. Where there is a fan motor, the fan motor starts and stops with the cold control and service men often mistake the running of the fan to indicate that the compressor is running. The best method of checking for an operating compressor is by laying your hand on the compressor dome to detect vibration.

"Motor Sticks—Will Not Run After Shutting Off"

Correction: Change relay.

This complaint invariably is a relay sticking and failing to reset. Tap the top of the relay case with your finger. If the compressor starts, it is usually a case of a sticking relay.

"Short In Motor—Blows Fuses"

Correction: (a) Change fan motor.

A short in the compressor motor will not blow a fuse, but will trip the overload in the relay. A short in the fan motor (where one is used), will blow the house fuse because it is not protected by the relay. The best way to determine where the short is located is to disconnect the three wires at the compressor and hook a calibrated relay and service cord assembly to the compressor to determine if the compressor will run. If the compressor runs, obviously the sealed unit is not at fault. A diagram of the relay and service cord assembly is shown in the diagram.

Correction: (b) Change relay.

There have been cases where the bottom of the relay bakelite base is broken, allowing the contact screws to short on the condensing unit frame.

"Compressor Will Not Run After Shutting Off"

Correction:

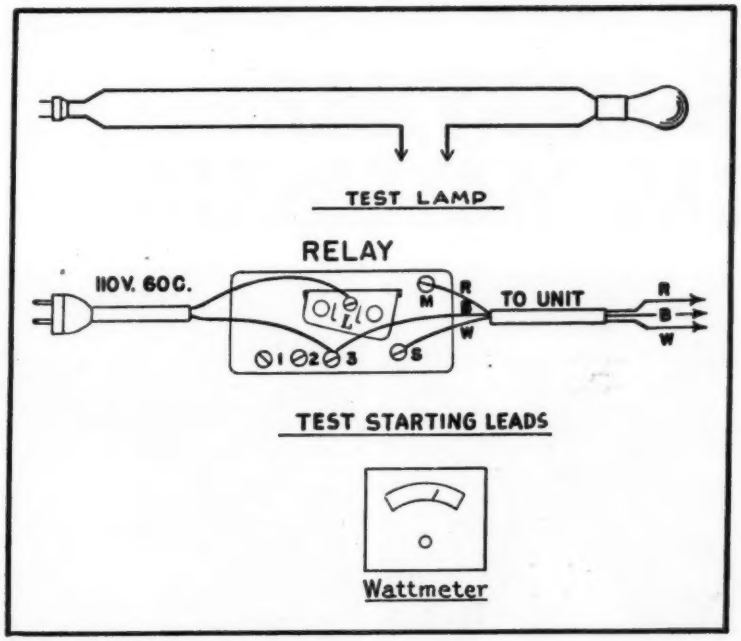
Allow enough time for the compressor to unload. Sealed household units, on the average, take about three minutes for the hot gas and liquid in the condenser to release through the small liquid line into the low side and balance the pressure on both sides of the compressor. The unit will not start until this has been accomplished but will continue to kick the overload two or three times until the three minutes have passed.

"Unit Will Not Run"

Correction: Wire relay correctly.

Trace the wiring through the relay to be certain that all wires are attached to the proper term-

(*Continued on page 46*)



The electrical equipment illustrated here will be found particularly useful in checking the electrical circuits of sealed units. Above is a simple test lamp equipped with an outlet plug. The test prods are connected in one side of the lamp circuit. Lamp lights to indicate a closed circuit. In the center of the drawing is shown the test starting leads with a calibrated relay. By connecting the test leads and relay directly to the sealed unit with all other wiring disconnected it is possible to determine whether electrical fault is in sealed unit or outside wiring.

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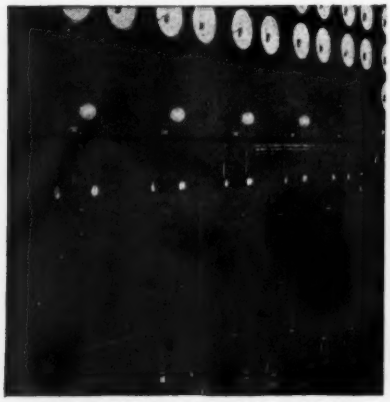

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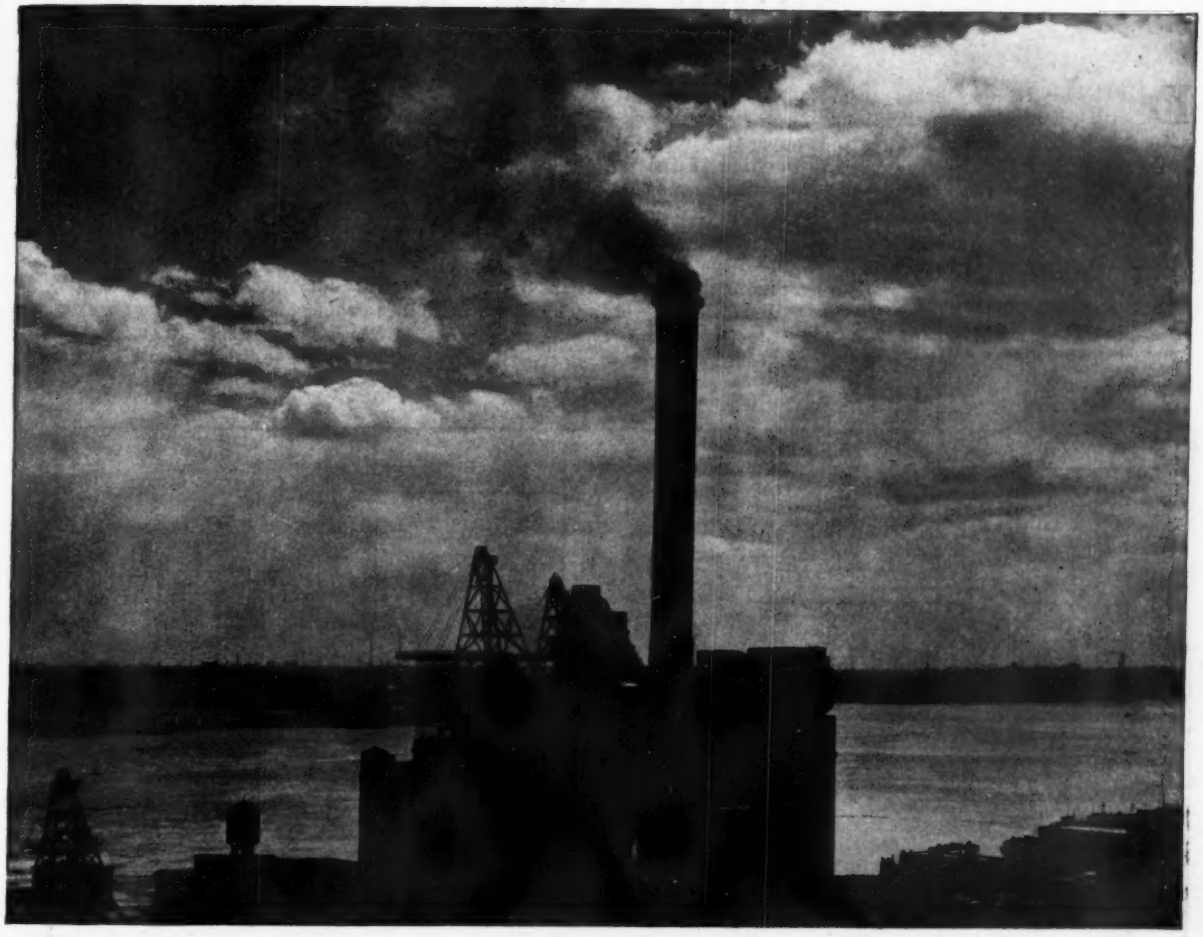

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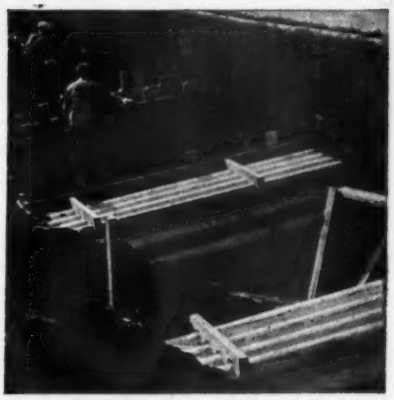

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Pushbutton Motor Control Application and Service

By L. E. Markle*

DEFINITION of terms used with pushbutton applications afford a foundation on which to build a few basic rules. Two terms that are sometimes confusing are low-voltage release and low-voltage protection.

Low-voltage protection allows all apparatus to be disconnected from the line if the power source fails or a disturbance occurs that causes the line voltage to drop to a very low value. In order to start the apparatus again, it is necessary to actuate the start button.

In order to obtain low-voltage protection, it is necessary to have a start button that closes the circuit only when it is being held down. An electrical interlock that is closed when the control has functioned parallels the start button and keeps the control circuit closed after the start button is released. When the control drops out because of voltage failure, the interlock opens the control circuit, thus giving protection against unsupervised starts when power returns.

Low-voltage release, on the other

*Mr. Markle is control engineer for Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.

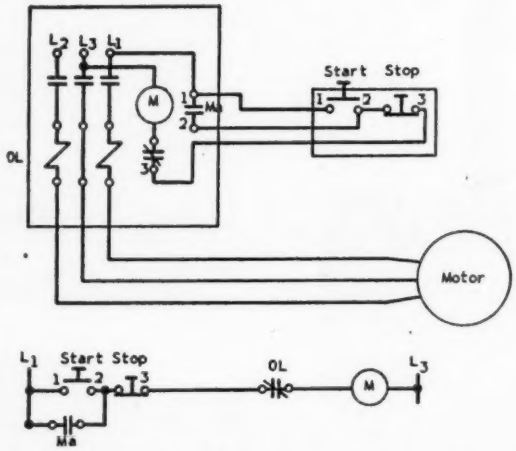

Fig. 1. Buttons: two momentary-contact, one closed, one open. Circuit: low-voltage protection, single station. Duty: start-stop.

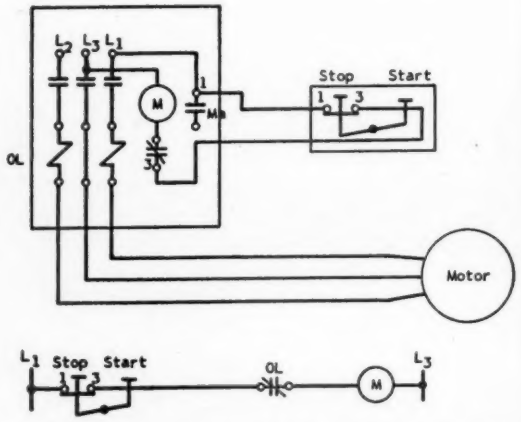

Fig. 2. Buttons: two maintained-contact. Circuit: low-voltage release, single station. Duty: start-stop.

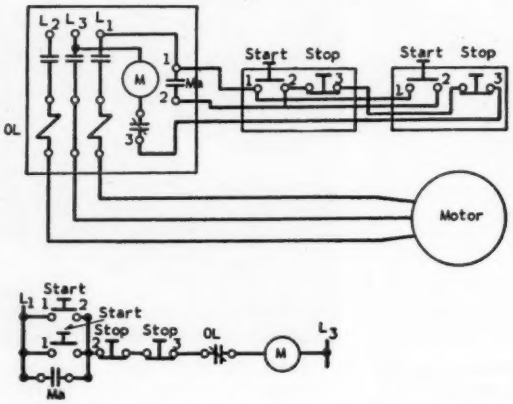

Fig. 3. Buttons: four momentary-contact, two closed, two open. Circuit: low-voltage portection, two stations. Duty: start-stop, start-stop.

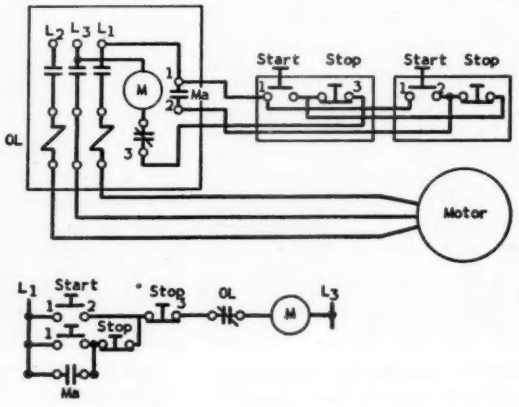

Fig. 4. Buttons: four momentary-contact, two open, two closed. Circuit: low-voltage protection, two stations. Duty: start-stop, start-stop.

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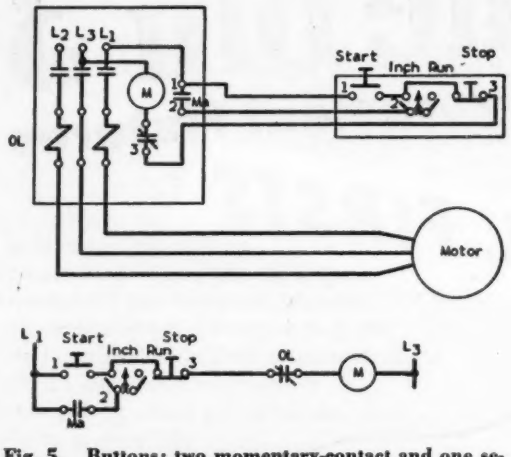


Fig. 5. Buttons: two momentary-contact and one selector switch. Circuit: low-voltage protection plus inching. Duty: start-run, inch-stop.

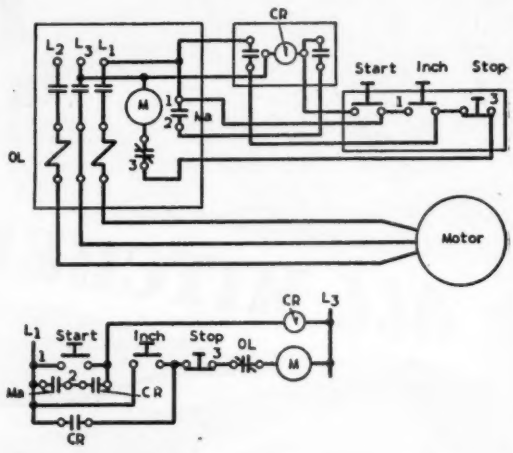


Fig. 6. Buttons: three momentary-contact and inching relay. Circuit: low-voltage protection plus inching. Duty: start-inch-stop.

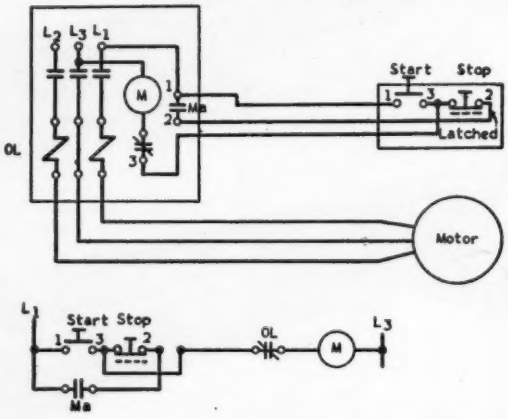


Fig. 7. Buttons: two momentary-contact, one open, one closed with safety latch. Circuit: low-voltage protection. Duty: start-stop (on inch for latch).

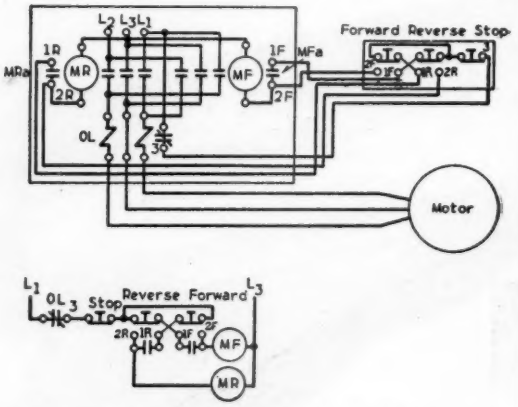


Fig. 9. Buttons: three momentary-contact, two open, one closed. Circuit: low-voltage protection interlocked through pushbuttons. Duty: forward-reverse-stop.

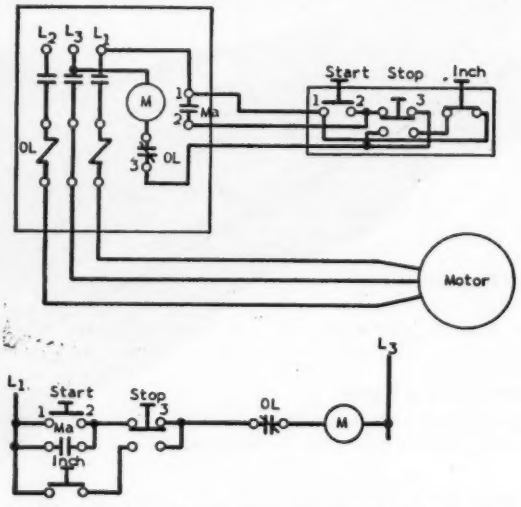


Fig. 8. Buttons: three momentary-contact, two open, one closed. Circuit: low-voltage protection, interlocked pushbuttons. Duty: forward-reverse-stop.

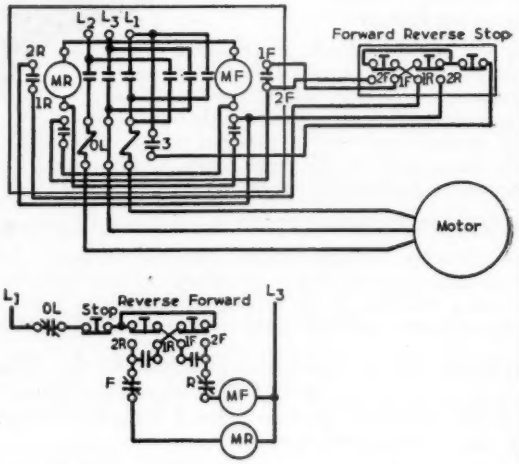
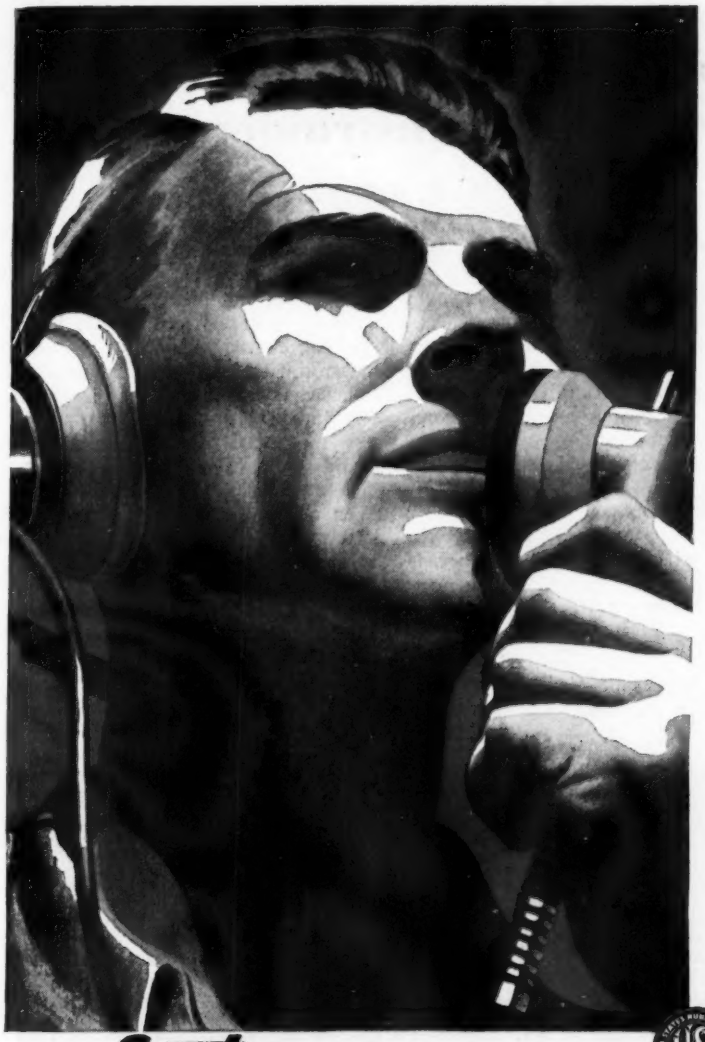


Fig. 10. Buttons: three momentary-contact, two open, one closed. Circuit: low-voltage protection with electrical interlocks. Duty: forward-reverse-stop.



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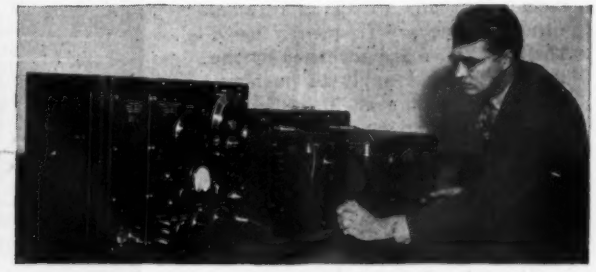

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hand, allows all parts to be disconnected from the line if for any reason the power source voltage is inadequate, but when the voltage again reaches sufficient value the control will function automatically to connect the apparatus to the line.

These two types of control circuits, commonly known as two-and three-wire control, require different types of pushbuttons. The low-voltage release control circuit requires a pushbutton that remains closed until released by hand. This type of pushbutton is known as the maintained type, and the contacts are held closed mechanically.

Low-voltage protection is secured by a momentary-contact-type pushbutton. Figure 1 shows the diagram for a low-voltage protection pushbutton connection; Figure 2, the diagram for low-voltage release.

A control button does one of two things—it either makes a circuit or breaks a circuit. Heavy-duty pushbutton stations are arranged so that either operation or both operations can be obtained on the same unit. This ability to make or break circuits is exceedingly useful when more than just the start and stop functions are desired.

Any combination of control sequence for low-voltage protection can be obtained by applying these two fundamental rules:

1. Wire all stop buttons in series with the holding coil, with each other, and with the electrical interlock.

2. Wire all start buttons in parallel with each other and with the electrical interlock.

Limit switches have not been included in any of the diagrams, although they are frequently used. These switches are governed by the same rules that apply to pushbuttons—that is, in most instances the pushbuttons can be replaced by a limit switch. Switches normally closed are similar to stop buttons, and those normally open operate as start buttons.

In the accompanying diagram number 1 has been used to designate the control circuit to the start button; 2, the point common to the start-stop button; and 3, the stop button. On some controls manufactured currently these same markings are used to aid in making common pushbutton connections. The holding interlock parallels the start button; therefore, in the schematic diagrams it is connected to points 1 and 2 of the pushbuttons.

Basic Use and Maintenance Of Electrical Instruments

By H. S. Day*

Part 8—How to Connect Instruments

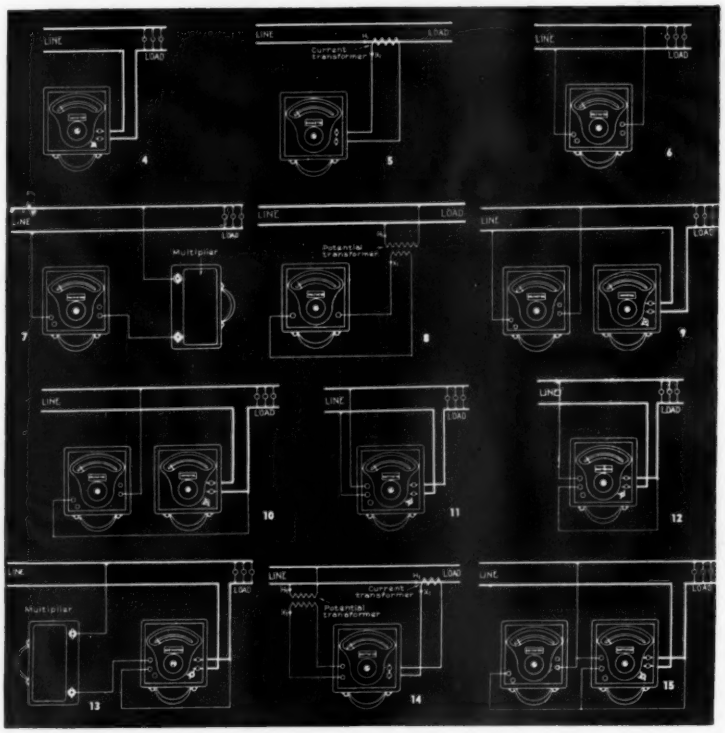
THERE ARE a number of basic rules covering the use of electrical measuring instruments with which the electrical tester should be thoroughly familiar. The following diagrams and the accompanying discussion covers all of the commonly used electrical instruments for alternating and direct current.

Always connect an ammeter in series with the load—never across it. Ground the current transformer secondary. If an ammeter is to be used in circuits of devices, such as motors, that have a high starting current, short out the ammeter until after the starting period. Or, if the instrument is to be left in the circuit for some time, use a short-circuiting switch to avoid damaging the instrument. The switch can be opened whenever a reading is to be taken.

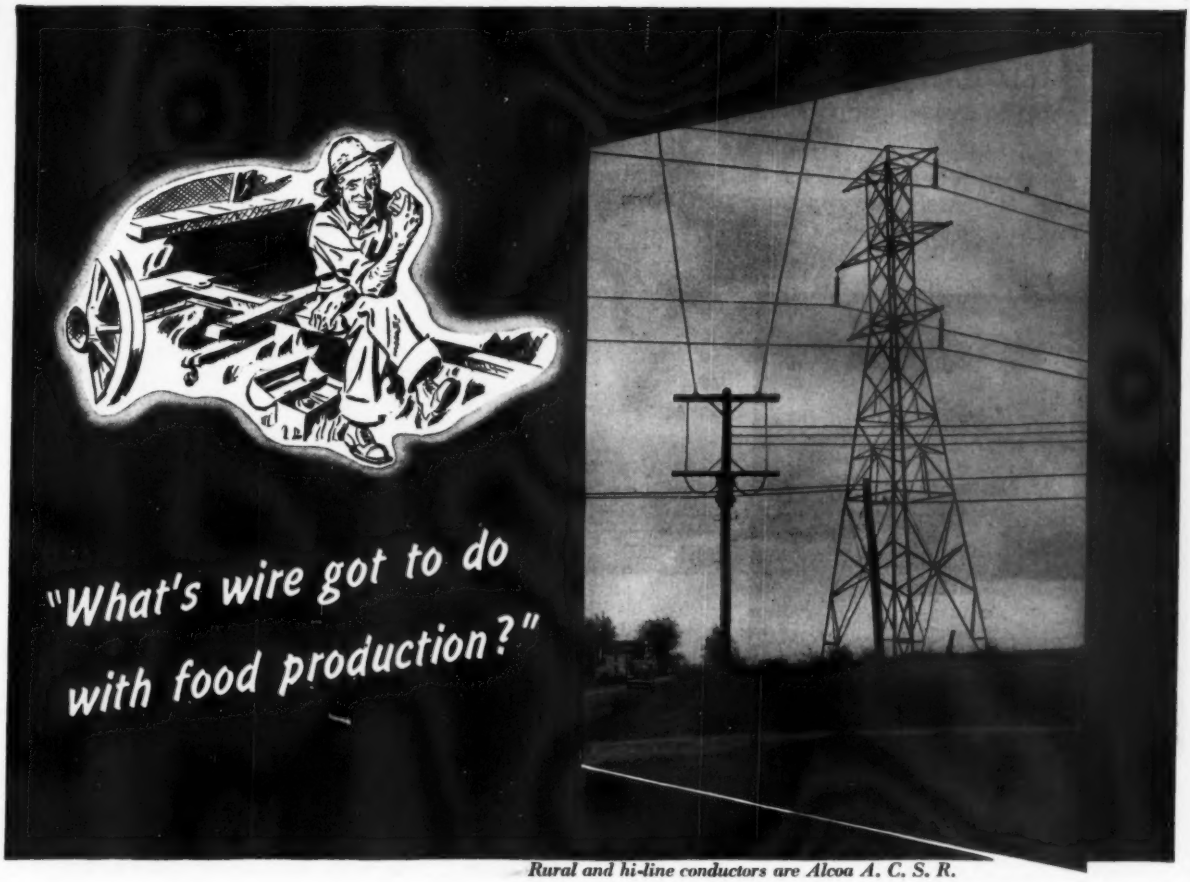
Always connect a voltmeter across the load — never in series. To extend the range of a voltmeter, a multiplier may be used. If a higher-rated voltmeter is not available, use a potential transformer. Ground the potential trans-

(Continued on page 36)

*Mr. Day is associated with the Meter and Instrument Division, Gneral Electric Company, Schenectady, New York.



These diagrams show proper method of connecting electrical instruments into circuits to determine voltage, current, wattage and power factor. (4) ammeter, (5) ammeter with current transformer, (6) voltmeter, (7) voltmeter with multiplier, (8) voltmeter with potential transformer, (9) voltmeter and ammeter, (10) voltmeter and ammeter, (11) wattmeter in single-phase circuit, (12) wattmeter in single-phase circuit, (13) wattmeter with multiplier, (14) wattmeter with current and potential transformers, (15) voltmeter and wattmeter.



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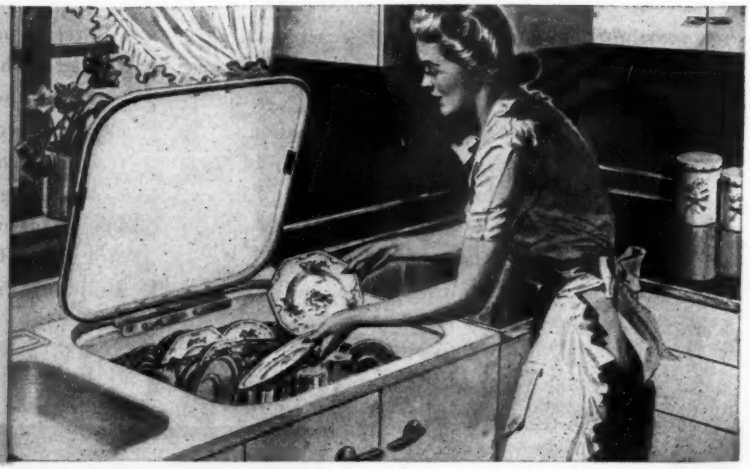
MARKET NO. 2

More Appliances in Present Homes



Current surveys, such as the recent one by FORTUNE magazine, show a great pent-up demand for electric, labor-saving devices in present homes.

The homeowner is learning about such kitchen helps as the frozen food storage unit, electric range, dishwasher, garbage disposal unit, and water heater . . . such laundry helps as the automatic washer and ironer.

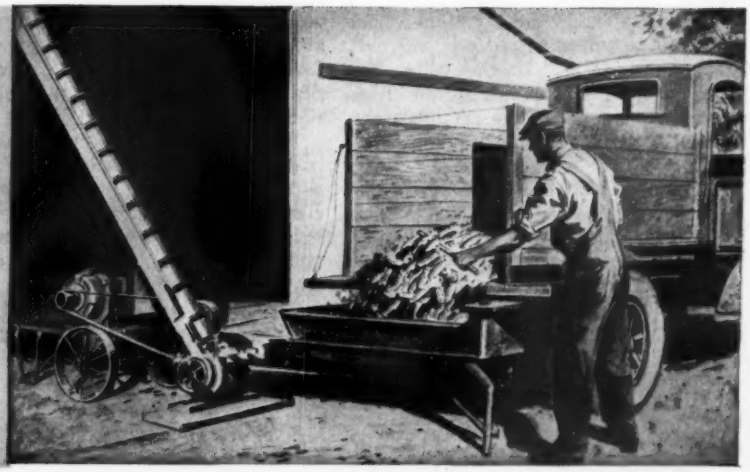
Through a wide educational campaign, General Electric is showing the public how to put these electric servants to work. We are confident of a great and growing demand for this equipment after the war.

This is the second postwar channel which will divert the power load from its war-factory outlets.

the slack in postwar power?

MARKET NO. 3

Farm work by Electricity



Here's one of the biggest potential markets of all. Approximately 2,500,000 farms are within one quarter mile of existing power lines.

And about 300,000 more farms will hook on to the hi-line every year after victory.

We are reaching the huge farm market through direct mail and national advertising. While there is a great deal of ground-work yet to be done both by General Electric and the power companies, rural electrification promises to be a prime market for added power consumption.

We realize the importance of using the tremendously expanded power capacity of the nation. Proper planning may mean the difference between prosperity and depression for large sections of our country.

General Electric is not waiting until the end of the war to recognize new power markets. We're promoting, advertising, and developing future sales of electric products and electric power today.

It is our feeling that a co-ordinated effort by General Electric and the utility companies will go still further toward making the adjustment to peacetime production relatively painless.

General Electric Appliance & Merchandise Department, Bridgeport, Conn.

FOR VICTORY

Today, General Electric is working full speed to hasten the day of Victory.

You can help, too, by buying War Bonds Now!

Everything Electrical for After-Victory Homes

GENERAL ELECTRIC

TUNE IN: "The G-E All-Girl Orchestra" Sunday 10 P.M.—E.W.T. NBC · "The World Today" news every weekday 6:45 P.M.—E.W.T. CBS

(*Continued from page 32*)
former secondary.

An a-c voltmeter connected to an inductive circuit (such as a generator-field circuit) should be disconnected before the circuit is opened. Otherwise, the inductive kick may result in a bent pointer or other injury to the instrument. The connection of basic instruments are shown in Figs. 4 to 8.

In Fig. 9 the voltmeter measures line voltage, not load voltage. The ammeter measures load current only. In Fig. 10, the voltmeter measures load voltage, not line voltage. The ammeter measures load current plus voltmeter current.

In Fig. 11, the instrument is measuring power load plus loss in its own current-coil circuit. If the instrument reads backwards, reverse the current leads. In Fig. 12, the instrument is measuring power load plus loss in its own potential-coil circuit.

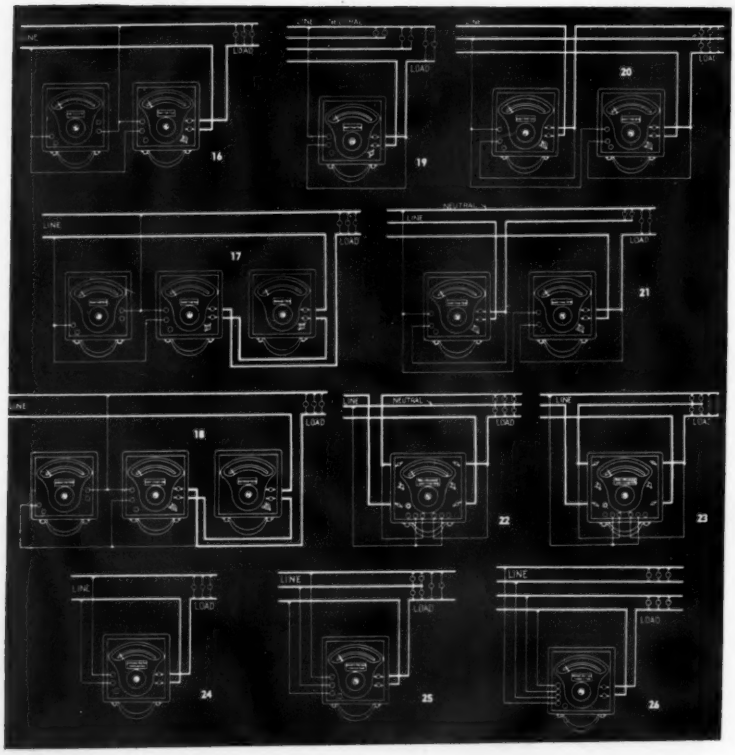
Special care should be taken not to overload wattmeters. It is possible to burn out a wattmeter without exceeding the full-scale reading. The reason is that a wattmeter reading is dependent on three factors: voltage, current, and power factor. Thus, it is possible to exceed the current or voltage rating without exceeding the full-scale indication.

Potential transformers are recommended on circuits above 300 volts. On circuits of 750 volts and above, potential and current transformers should be used. Always ground the secondary of the potential transformer circuit.

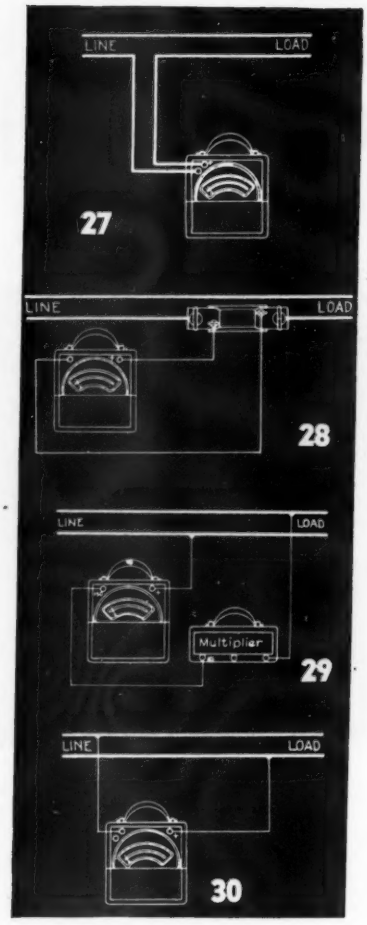
In Fig. 15, the wattmeter measures power load plus losses in the voltmeter and wattmeter potential circuits.

In Fig. 16, the wattmeter measures power load plus loss in its own current-coil circuit.

Power factor is determined by dividing the wattmeter reading by the product of the ammeter and voltmeter readings.



(16) voltmeter and wattmeter, (17) voltmeter, wattmeter and ammeter, (18) voltmeter, wattmeter and ammeter, (19) single-phase wattmeter in balanced 3-phase, 4-wire circuit, (20) two wattmeters connected for 3-phase balanced or unbalanced voltage or loads, (21) two wattmeters connected 2-phase, 3-wire for balanced or unbalanced load, (22) poly-phase wattmeter in 2-phase, 3-wire circuit for balanced or unbalanced voltage or load, (23) polyphase wattmeter in 3-phase, 3-wire circuit, (24) singlephase power factor meter, (25) 3-wire, 3-phase power factor meter, (26) 4-wire, 2-phase power factor meter.



These diagrams show methods of connecting instruments for direct current measurements. (27) ammeter, (28) millivoltmeter and shunt for measuring current, (29) voltmeter with multiplier, (30) voltmeter.

In Fig. 17, the wattmeter measures power load plus losses in the ammeter and wattmeter current-coil circuits.

In Fig. 18, the wattmeter measures the sum of the power losses of the load, the potential circuit of the wattmeter, and the voltmeter.

While only the wattmeter connections are shown, the ammeters and voltmeters can be connected as shown in the two preceding diagrams.

In Fig. 19, the power of the system is three times the indications of the wattmeter. The wattmeter indicates its own potential losses plus the power in one phase of the load.

In Fig. 20, the two wattmeters will not indicate alike, even if the load is balanced. Above 50% pow-

(*Continued on page 46*)

* Continuously-milled rigid steel pipe, twice protected against corrosion by a sherardized zinc coating and a final acid and alkali-proof covering.

WIRE WITH WALKER

will come out of this war tougher and better than ever!

Before the war, Walkerized Dualcote Rigid Steel Conduit had already proved its durability under the worst corrosive conditions. In laboratory tests and in actual use, its superior finish had defied acids, alkalies and salt water where ordinary conduits had failed to stand up.

War has restricted the manufacture of Dualcote for general use. But in its wartime uses, Dualcote has had to withstand the most severe conditions on land and at sea.

Consequently, when wartime restrictions are lifted, you'll find Dualcote conduit even "tougher" and more durable than ever. Its *fighting finish* will be ready to *take it* in chemical plants, dye houses, mines, mills, refineries — or in any other installation that requires a conduit that can defy corrosion!

Ask your local distributor about prices and deliveries. For further information, write to Walker Bros., Conshohocken, Pa.

Laying Out Lap Windings for Two-Pole Motor Armatures

By A. C. Roe

THE ARMATURES used in small two-pole motors are mostly lap wound and the lead data is important when rewinding. The following data in quiz form will check and should improve the reader's knowledge of lap winding, methods of checking, recording, winding, and lead connecting data. There are certain definite relations that exist between lineout from tooth or slot to bar or mica, depending upon the number of single coils per slot and the coil pitch.

These relations are shown in Figs. 1 to 4 and the true or false questions will consider the important items of lap winding rules, which in conjunction with the sketches should bring out some interesting information.

1. In lap winding there are two basic methods of recording connecting data. True or false?

True. One method uses the centerline of the coil as a base. See Figs. 1 and 2. The second uses the centerline of the bottom slot as in Fig. 3.

2. When using the centerline of the coil for the base line it will always fall on a slot. True or false?

False. When the coil pitch is one and an even number the centerline will fall on a tooth. See Fig. 1.

3. When the coil pitch is one and an odd number its centerline will fall on a slot. True or false?

True. As shown in Fig. 2 an even coil pitch as 8, or 1 and 9, will have its centerline on a slot.

4. The number of single coils in the bottom of slot No. 1 has no effect on the connecting data. True or false?

False. This factor when using the coil centerline method determines whether the coil centerline falls on the mica or a bar. See Figs. 1 and 2.

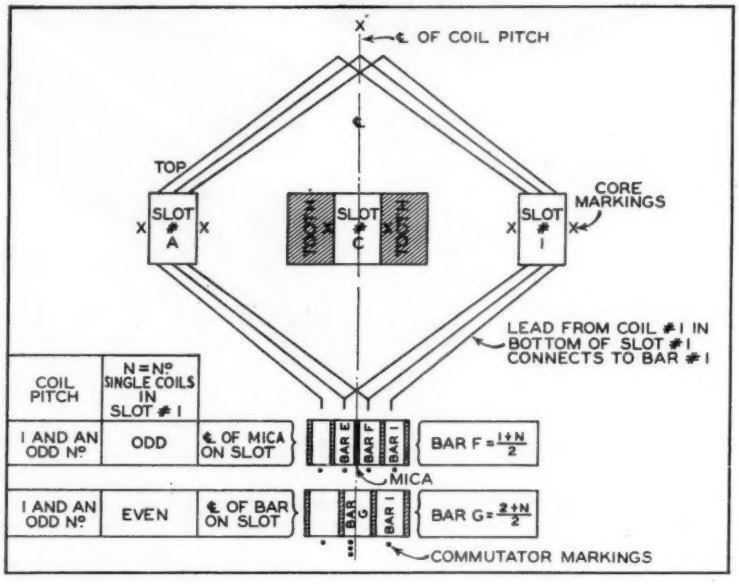
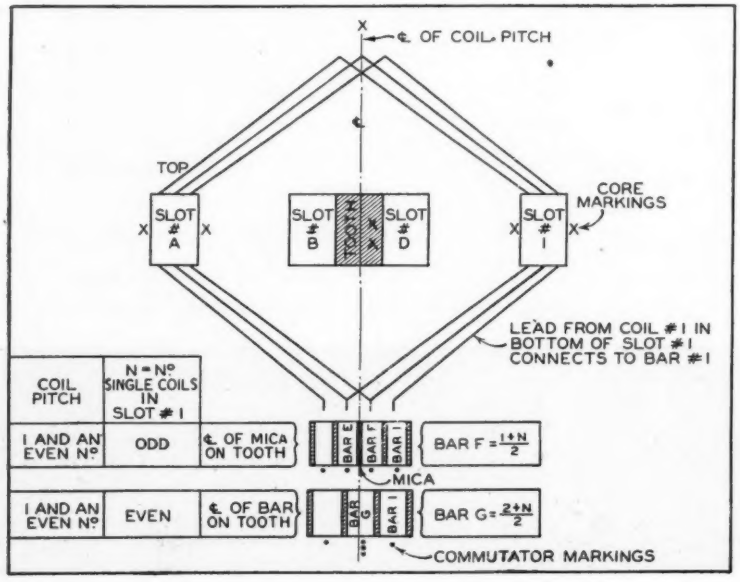


Fig. 1 (Below) Diagram showing coil and lead pitch for lap windings using centerline of coil on centerline of tooth as basis for layout.

Fig. 2 (Right) Similar diagram for lap windings using centerline of coil on centerline of slot as basis for layout.



5. With an even number of single coils in the bottom of slot No. 1 the centerline of the coil will fall on the centerline of a bar. True or false?

True. As shown in Figs. 1 and 2 this throws the coil centerline on a bar while an odd number of single coils lines out on the mica.

6. When using the centerline of the coil data method there is no relation between coil pitch and single coils per slot. True or false?

True. The coil pitch, odd or even, determines whether the line falls on a tooth or slot, while coils per slot, odd or even, determine whether line falls on mica or bar.

7. When laying out connecting data on a new lap winding it is unnecessary to mark the core. True or false?

False. Core markings as shown in Figs. 1 to 3 locating the start-

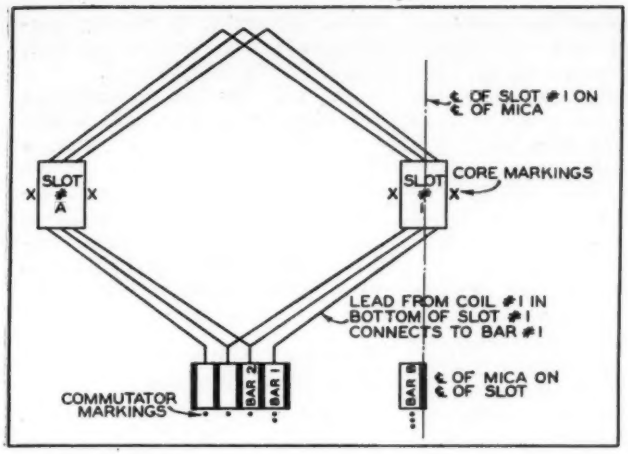

℄ OF SLOT #1 ON ℄ OF MICA
SLOT # A
SLOT # 1
CORE MARKINGS
LEAD FROM COIL #1 IN BOTTOM OF SLOT #1 CONNECTS TO BAR #1
COMMUTATOR MARKINGS
BAR 2
BAR 1
BAR B
℄ OF MICA ON ℄ OF SLOT

Fig. 3 (Left) This diagram illustrates lead pitch for small motor lap windings using lineout from bottom slot to centerline of mica as basis of layout. If N = total number of bars, S = number of single coils in slot 1, and P = coil pitch in slots (if 1 and 8, then P = 7), then Bar B = N — (S/2) × (P—2). If this results in a fraction then use lowest whole number. As an example, a motor with 24 slots, 72 bars, pitch of 1 and 6 may be considered. N = 72, S = 3, P = 5. Then B = 72 — (3/2) × (5—2) = 67½, or Bar B = 67.

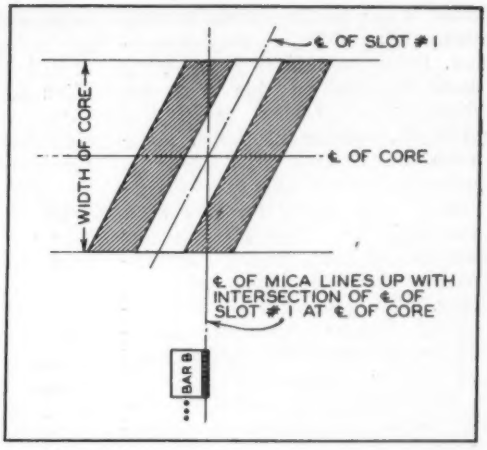


Fig. 4 (Right) This diagram shows method of lining out for lap winding in the case of skewed slot armature, using layout as shown in Fig. 3.

ing coil and throw coil region which in turn is helpful if trouble develops later to determine whether the throw coils were involved.

8. Center punch marks on the ends of commutator bars are helpful in lap winding layouts. True or false?

True. They definitely locate the proper bars in relation to coil pitch.

9. The center punch marks on the commutator bars serve no other purpose than to locate lead pitch. True or false?

False. Four or any even number of single dots indicate to the inspector and tester lineup on mica and an odd number of single coils. See Figs. 1 and 2.

10. Three center punch marks on the end of one commutator bar as in Figs. 1 and 2 have a meaning other than locating lead pitch. True or false?

True. It indicates lineup on a bar and an even number of single coils per slot.

11. Lead and coil pitch data can be recorded and laid out without using the relation between odd and even coil pitch and coils per slot. True or false?

True. A method used for small motors is shown in Fig. 3 which uses the "centerline of slot No. 1 on the mica" in front of the slot as a base.

12. With armatures having skewed slots, the data should be taken from the front end of the core. True or false?

False. The line out should be from the center of the core as in Fig. 4.

13. A sketch is required for each armature to properly record rewinding data. True or false?

False. Master sketches as in Figs. 1 to 4 can be used and numbers added after a letter and figure number given for reference.

14. The number 1 used to locate the slot into which the bottom coil half is put can be used to indicate left or right hand coils. True or false?

True. The 1 placed at the right of the sketch indicates a left hand coil; when placed at the left, it means a right hand coil.

Operating Experience With Steel Electrical Conductors

By F. W. Smith*

DURING THIS war as during World War I, the majority of the electric utilities have been forced by regulations to substitute steel wire for copper or aluminum as electrical conductors.

In 1917 and 1918, the Virginia Electric and Power Company's predecessor installed ordinary stranded guy wire, which did not have a very good galvanized coating, on circuits with voltages 110 kv and lower. On 110 kv circuits the ⅜" stranded steel conductor operated for twenty years and while rusty on the outside it would have operated for five more years had not system changes required that the 110 kv circuits be removed from operation completely. Some steel guy wire on 11 kv circuits also remained in service for as much as twenty years. These steel cables were designed for mechanical strength, yet they held up very well as electrical conductors.

During the past few years the various companies manufacturing steel strand have improved the electrical characteristics of their steel strand so that they could sell it as conductor for lightly loaded lines. These steel conductors were not used extensively until the outbreak of the present war when restrictions on copper and aluminum made necessary the use of steel conductors in certain cases if electric service was to be rendered.

After considering the characteristics of steel wire available on the market for conductor use, we de-

*Mr. Smith is general engineer for the Virginia Electric and Power Co., Richmond, Va.

cided to use No. 4 and No. 6 three strand wire with a galvanized coating. From the limited engineering data available on this wire, we chose wire of low mechanical strength, namely 2500 lbs. minimum, in the two sizes since the current carrying characteristics appeared to be better for this wire. The majority of the wire was for use in serving housing developments where the spans were not long. The use of steel wire required fittings which were necessarily different from those used with other conductors.

Number 8 soft galvanized steel wire was used for tie wire, and galvanized splices of either the mechanical or pressed type were used to splice the conductors. One bolt guy clamps were used to make taps on steel wire.

Whenever steel wire is connected to copper, or vice versa, the steel and copper wires are dead ended and the connection of dissimilar metals is made in the loop so that in case there is action between the copper and galvanizing, the main conductors will not be weakened in a span where breaking would cause the line to fall. These special fittings have not caused any hardship and we have not experienced any mechanical troubles with the use of the wire.

Several months ago a short section of 110 kv line was constructed by us to serve a 5000 kilowatt load. In order to conserve copper it was decided to use steel for conductors. Calculations showed that 3/8" steel strand with the characteristics of steel wire for electrical conductors, as made by one manufacturer, would carry the current required. This line has been operating satisfactorily for about a year.

The use of steel conductors has proved satisfactory from an electrical standpoint when used on primary voltage circuits, providing currents do not exceed limits for the wire based on the resistance and reactance of the wire and the allowable voltage drop.

This wire has not proved satisfactory when used for 120/240 volt secondary service where motors are used. The wire does reasonably well for straight lighting and incidental heating loads when held within the current limitations, but the starting current required by small motors, particularly water pump motors, causes voltage fluctuations that cannot be endured. A voltage chart taken from one service using steel wire for secondaries indicated normal voltage variation from 110 to 120 volts, but with a small water pump running the swings were from 95 to 120 volts. Still another chart showed the normal voltage variations of from 108 to 122 volts and with a water pump running the swings were from 90 to 122 volts.

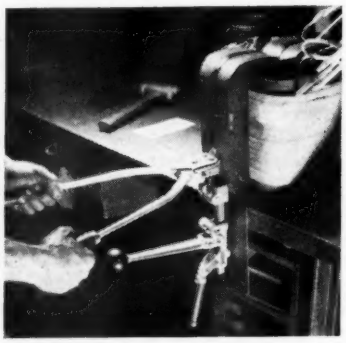
We feel that the life of steel conductor will be satisfactory, but that its lack of current carrying capacity may necessitate the replacement of some of it after the war. At numerous locations the loads supplied by the steel wire will probably diminish after the war, leaving adequate capacity in the steel wire for years to come.

New Cores for Transformers Provide Increased Capacity

These days one is indeed lucky to get repairs made at all, much less achieve an improvement in the process. Power companies, however, can accomplish this very thing with respect to distribution transformers, according to Westinghouse engineers.

Because only a few distribution transformers are being manufactured now the old ones must be kept in repair. Thousands of old units (in which coils have failed) have been fitted with new Hipersil cores and new windings. Because Hipersil cores are so much smaller than the old cores of hot-rolled silicon, it is usually possible to get a core of the next larger size in the old tank.

An old five-kva distribution transformer becomes, with a Hipersil core, good for 7½-kva; a 7½-kva unit, gets a new rating of 10-kva, etc. This is accomplished without requiring additional core, copper, or insulating material and of course saves the old tank, bushings, and other parts.



Transformers repaired in this manner have capacity increased. A new core made of wound Hypersil instead of stacked laminations accounts for the increase. After being impregnated with a bonding material, the core is cut in two so the machine wound core can be inserted in coil. The special tool shown here applies band with proper tension to hold core together.

Wartime Achievement By Knoxville Shop

(*Continued from page 9*)

achievement of the Bell Armature Works, the Southeastern Procurement District of the Army Air Forces Materiel Command, Atlanta, Ga., had this to say:

"The precision parts for aircraft devices made by the company are of such close tolerance and delicate precision that, according to the company which gave it the subcontract, Bell was 'the only man who would even undertake to produce the parts because of the extremely accurate machinery, patience, and initiative required to meet the minutely close tolerances and specifications required."

During the entire transitory period, Bell was assisted by his devoted wife, who serves as bookkeeper, inspector, and takes part in training new personnel in precision work.

In April, 200-pound Mr. Bell was "as happy as a June bride." The Army-Navy "E" fluttered from a new flagpole on the sloping green lawn of the plant, presented by high officials of the Army and Navy who paid tribute to Bell Armature Works.

The Bell plant only employs 14 workers, 10 of whom are women. But in the words of the AAF Materiel Command, Atlanta, it "is contributing a vital need to the war effort and its work is being recognized by the AAF Materiel Command, just as much as if it were a plant hiring 16,000 workers."

Col. R. W. Propst, supervisor of the Southeastern Procurement District of the Command, with headquarters in Atlanta, added this:

"The Materiel Command needs these thousands of small plants as well as the huge aircraft factories in meeting the tremendous goals set for combat aircraft production. It is glad of the opportunity to honor the contribution of one of these small plants."

MOVE OR ADD LIGHTS WITHOUT REWIRING - WITH UNIVERSAL Trol-E-Duct

4 BIG HELPS TO PRODUCTION

1 Puts Lights Where They Are Needed—Close to the Work

Universal Trol-E-Duct is a job-proven, modern refinement in factory lighting. Every inch of the duct is a potential electrical outlet which can be instantly tapped to put light close to the work. Simply move the light along the overhead duct, or plug in new lights wherever needed.

2 Always Ready for Quick Production Changes

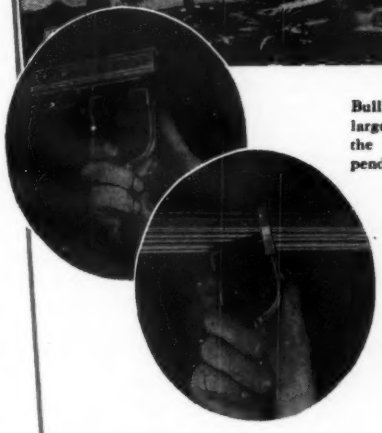
Universal Trol-E-Duct, built in standard sections, is quickly and easily installed, and can be moved as easily to another location. It is an extremely flexible system — 100% salvable — always ready for quick production changes.

3 Fits Any Production Set-Up

It can be mounted against the ceiling or suspended by messenger cable below it. It will fit the layout of any industrial plant or commercial building.

4 Accomodates Any Type of Lighting Fixture

No matter what type of lighting fixture you use — fluorescent, mercury vapor, or incandescent — Universal Trol-E-Duct can accommodate it because every unit of the system is pre-fabricated at the factory for a wide variety of lighting fixtures.



BullDog's Universal Trol-E-Duct installation in a large midwestern machine tool plant. Note how the closely spaced fluorescent fixtures are suspended and tap current from the Trol-E-Duct runs.

• • •

Extreme Left — Shows how simply the trolley may be inserted at the end of the duct runs. Trolley entrance couplings also make possible insertion of trolleys between sections.

Immediate Left—The Twistout Plug can be used at any point in the duct run simply by inserting it in the duct slot and giving it a 90 degree turn.

BullDog Universal Trol-E-Duct is a lighting system of assembled standard duct sections, tightly and safely enclosing copper bus bars from which trolleys and twistout plugs collect current.

Thousands of war plants, big and small, find this thoroughly modern lighting system an important factor in speeding production by bringing light close to the work.

If conditions do not permit you to change over to this easy, quick, flexible lighting system now, be sure to modernize with Universal Trol-E-Duct before the products of peace go to market again.

Buy More War Bonds — Turn in Your Scrap

BULLDOG
ELECTRIC PRODUCTS CO.

BOX 177, R. PK. ANNEX
DETROIT 32, MICHIGAN
BullDog Electric Products of Canada, Ltd., Toronto, Ont.

Field Engineering Offices in All Principal Cities

ALSO MANUFACTURERS OF

VACU-BREAK SAFETY SWITCHES • SAFTOFUSE PANELBOARDS • SWITCHBOARDS • CIRCUIT MASTER BREAKERS • BUSTRIBUTION DUCT *for "Plug-in" power* • INDUSTRIAL TROL-E-DUCT, *for movable "loads."*

Advantages of Three Dimensional Seeing

(*Continued from page 14*)

First, when continued, it tends to injure the eye and to disturb the nervous system. Second, it causes discomfort and fatigue and thus reduces the efficiency of the worker. Third, it interferes with clear vision by contracting the pupil of eye and thus increases the risk of accident and injury to the worker. Every effort should be made to eliminate glare in work places whether caused by daylight or by artificial light.

Glare may be either direct or reflected, depending on whether the undesirable light comes directly from the light source or is reflected from a polished surface. Direct glare is usually caused by a small but intensely bright light source, such as a bare lamp. The RLM dome reflector commonly used in industry is a very efficient unit, but it produces considerable glare. Generally speaking, the larger the light source, the less will be the direct glare. The fluorescent lighting unit now coming into common use produces but little direct glare because the light emitted per unit is comparatively low. In general, direct glare can be eliminated by the proper selection and location of the lighting units.

Reflected Glare Troublesome

Reflected glare is difficult to deal with because it is due to light reflected by bright surfaces well within the field of vision. Any small but highly polished area contributes its share of reflected glare. While the proper selection and location of the light source will greatly reduce this discomfort, much can be done by the proper application of color to relieve the difficulty. Flat-finish paints of a cream or light buff color can be used in many places to eliminate the undesirable light. This is possible because when the entire area under observation is reflecting light, the glare from polished points is not so noticeable. Light colored ceilings and walls will also help to reduce reflected glare. A careful inspection of any section in a textile plant will reveal many opportunities to eliminate this major cause of eye strain and mental fatigue. Here is the handle of a control, once painted red but through use polished to a mirror-like surface, contributing its share of reflected glare. There is a machine with its original black or green paint, but at certain angles the glassy surface reflects the light from an unshielded lamp into the workers eyes. Other examples could be given to show that each machine presents it own problem, but a problem which can be solved by the application of three fundamental rules of lighting.

First, the quantity of light falling on the working plane must be sufficient for the task involved. Recent studies indicate that for maximum efficiency for various types of work the following intensities should be considered:*

100 foot-candles or more: For very severe and prolonged tasks, such as fine needlework, fine engraving, fine penwork, fine assembly, sewing on dark goods and discrimination of fine detail of low contrast as in inspections.

50 to 100 foot-candles: For severe and prolonged tasks such as proof-reading, drafting, difficult reading, watch repairing, fine machine work, average sewing.

5 to 50 foot-candles: For moderately critical and prolonged tasks such as clerical work, ordinary reading, common bench work and average sewing and other needlework on light goods.

10 to 20 foot-candles: For moderate and prolonged tasks of office and factory and, when not prolonged, ordinary reading and sewing on light goods.

5 to 10 foot-candles: For visually controlled work in which seeing is important, but more or less interrupted or casual and does not involve discrimination of fine details of low contrast.

0 to 5 foot-candles: The danger zone for severe visual tasks and for quick and certain seeing. Satisfactory for perceiving larger objects and for casual seeing.

The second fundamental principle to be considered is quality of light. This refers to the special character of the light as well as to the elimination of direct glare. While natural light or white light is usually considered best, studies reveal that from a physiological point of view, the light from the incandescent lamp, the mercury lamp and the fluorescent lamp is satisfactory for practically all purposes, providing there is enough of it. There may be a psychological objection to the blue light from the mercury lamp, but this light seems to have no adverse effect on the eye. The avoidance of direct glare can be obtained by the proper selection and location of units. Fortunately, the low light output per unit area of the fluorescent lamp reduces the direct glare from this unit to a great extent.

*From "Eye Hazards in Industry," by Resnick.

Light Distribution

The third fundamental principle deals with the distribution of light. Here the light-reflecting characteristics of paints can be used to advantage. It is generally known that dark surfaces absorb most of the light falling on them while a white surface reflects a large percentage. If all objects in a room were painted with a light-reflecting paint, each object could be classified as a low intensity light source. The reflected glare would be reduced because there would be less difference between the painted surface and the area producing the glare.

Since all surfaces would be light reflecting rather than light absorbing, the general light intensity would be increased and the contrasts due to shadows would be reduced. The choice of colors would have to be a compromise between the best light reflecting surface and the surface easiest to maintain. The paint is used to improve illumination because those colors which reflect light best will also show dirt more plainly.

Research conducted by the Philadelphia Electric Company in collaboration with the E. I. DuPont DeNemours & Co. (Inc.) reveals there are many advantages to the use of color in improving illumination, high-lighting danger zones, increasing production and reducing fatigue. Their studies show that the best combination of colors for a machine shop is light grey for the general surfaces of the machine and light buff to make the working areas and danger zones stand out. The light grey was found to be comparatively easy to keep clean while the light buff gave a high light reflection and consequently reduced eye strain in the work area.

In the textile plant the problem of grease and oil is not as serious as in the machine shop, but dust and lint would have to be considered.

For SAFETY'S sake . . . use CONDUIT
(Full Weight Rigid Steel)

REAL Protection

PLANT reconversion after Victory will bring opportunity to replace unsafe emergency wiring methods and war-time substitute materials with approved time-tested systems.

You can count on using standard-threaded, full-weight rigid steel electrical conduit wherever real protection is needed -- for strength and endurance, for prevention of penetration of moisture, vapors and dust, for effective resistance to shock, vibration, corrosion, arcing and short circuiting.

After the demands of war are satisfied, you'll be able to get all the rigid steel conduit you want. Your distributor will have Youngstown BUCKEYE CONDUIT in stock again -- in all the sizes and quantities you'll need.

THE YOUNGSTOWN SHEET AND TUBE COMPANY
YOUNGSTOWN 1, OHIO
Manufacturers of
CARBON, ALLOY AND YOLOY STEELS

Right - This upper floor remained unfinished for several years. The rigid steel conduit afforded vital protection to wiring, against careless workmen and intruders.

Ask your distributor for:
Youngstown Buckeye Conduit . . . Pipe and Tubular Products . . . Sheets . . . Plates . . . Tin Plate . . . Bars . . . Rods . . . Wire . . . Nails . . . Tie Plates and Spikes

Hotpoint is Pre-selling

. . . with Powerful—Dynamic New Advertising Technique

NOTICE Hotpoint's 1944 national advertising in the magazines shown below. For the first time in electric kitchen advertising, Hotpoint introduces, in its 1944 program, the "cut-away" technique. This is a favorite editorial method of popular national magazines for pictorializing construction details. The "cut-away" gives a visual explanation of the inside of a Hotpoint Electric Kitchen — points reader interest to all kitchen appliances—clearly defines the meaning of a Hotpoint Electric Kitchen. It sells the whole kitchen as a complete unit, rather than the individual appliances. Hotpoint's advertising technique for 1944 shows them "what makes a Hotpoint Electric Kitchen tick." It is adding constantly to the already tremendous interest in Hotpoint.

Following Through on the Bond Wagon Drive

This new advertising follows logically the very successful "Bond Wagon" campaign of the past two years, which featured "Buy War Bonds Today — Electric Kitchens Tomorrow." That campaign did a triple job: 1. Sold War Bonds. 2. Made the public want Hotpoint Electric Kitchens. 3. Provided for payment of those Kitchens with War Bond savings.

Reaching the Mass Market

In all this advertising, the big appeal is to the mass market. Each advertisement stresses that even low-cost homes can afford Hotpoint Electric Kitchens. And remember that these advertisements are talking to both town and farm families right in your community.

With thousands of families saving and planning for Hotpoint Electric Kitchens, the Hotpoint franchise means more today than ever before.

Write for free copy of the beautiful 28-page guide for Kitchen planning—"Your Next Kitchen by Hotpoint."

Edison General Electric Appliance Company, Inc.
5614 West Taylor Street, Chicago 44, Illinois

BETTER CARE LESS REPAIR

More than 90,000,000 Hotpoint messages will be delivered in 1944 by:

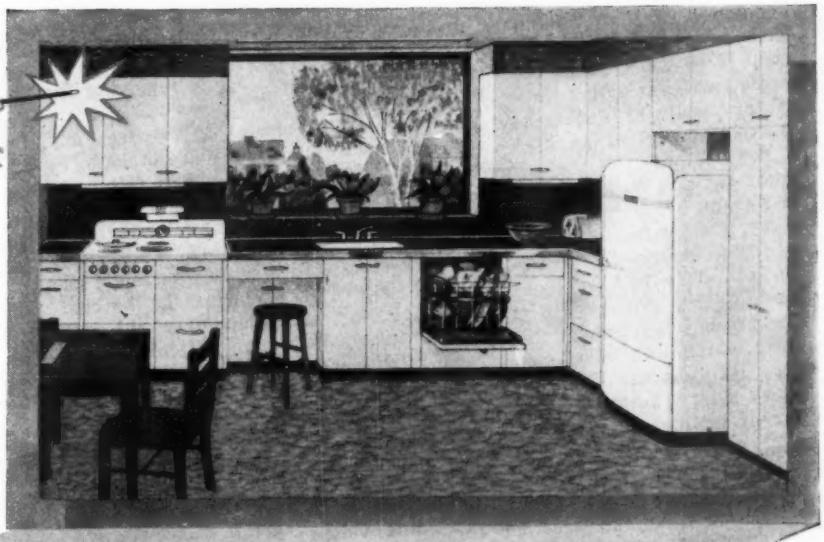
For outstanding achievement in War Production

ELECTRIC **Hotpoint** KITCHENS

REFRIGERATORS · RANGES · WATER HEATERS · WASHERS AND IRONERS · CLOTHES DRYERS · AUTOMATIC DISHWASHERS · ELECTRONICS · STEEL CABINETS

Your Postwar Customers

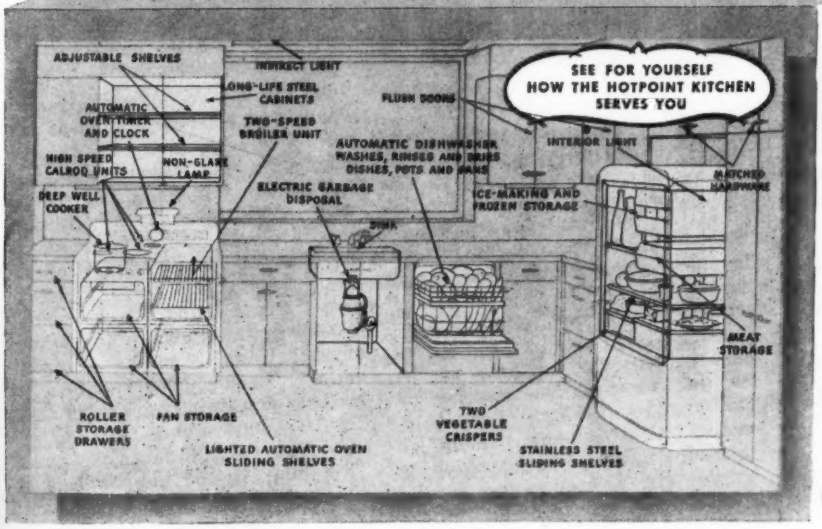
Your Next Kitchen can LOOK like this...



YES, it's *true!* Your dream kitchen is *almost* a reality. That Hotpoint Electric Kitchen you and Jim have been saving War Bonds for will be priced so reasonably even modest incomes can afford one!

And it's going to be as practical as it is beautiful! For our engineers and designers know how to combine modern utility and modern styling so that *your* new room will be not only a time-saver but a real joy in which to work and *live!*

and Hotpoint *will save you time on All these tasks!*



The cost of a Hotpoint Electric Kitchen averages about 10% of home-building costs.

FOUR MAJOR CENTERS SIMPLIFY WORK IN THE HOTPOINT ELECTRIC KITCHEN

Food Preservation Center—Hotpoint Electric Refrigerator keeps foods fresh longer—provides faster, thriftier freezing and better storage space.

Food Preparation Center—Hotpoint Electric Range, with all utensils stored within arm's length, cooks faster and thriftier. Since there's no combustion dirt, pans, walls stay clean. Automatic controls end cause of cooking failures.

Sanitation Center—Hotpoint Electric Dishwasher, Sink and Disposall wash and dry dishes, pots and pans cleaner than ever without your hands touching water. Food waste is whisked away electrically. Space provided for soap, towels, etc.

Equipment Storage—Electrically lighted Hotpoint Steel Cabinets afford abundant space for dishes, utensils and dry foods.

Edison General Electric Appliance Co., Inc.
5651 West Taylor Street, Chicago 44, Illinois
Enclosed please find ten cents in coin or war stamp for which send me your new kitchen planning guide entitled, "Your Next Kitchen by Hotpoint."

Name_____

Address_____

City and State_____

Hotpoint ELECTRIC KITCHENS

ARMY-NAVY FOR EXCELLENCE IN WAR PRODUCTION

Production Line Method Speeds Radio Service

(*Continued from page 23*)

be delivered from the parts houses.

This company makes no pickups or deliveries. This was discontinued soon after Pearl Harbor and with very little complaint on the part of the public. Most customers can easily bring their radios to the shop, even cabinet models, and the shop gets all the business it can handle that way. The only time a mechanic gets out of the shop is to work on an automobile radio out front and if there is any major repair it is detached from the car and taken inside.

Proprietors of the Chapman company are William and George Chapman, brothers, the latter now away in the army. Also associated in business with them is James Godwin. The concern has been in business for 15 years, 10 years at the present location on the city's main north and south thoroughfare. Its prominent location marked by a large neon electric sign is one of its biggest assets. A display advertisement in the telephone directory has also been a business getter.

William Chapman ascribed the big increase in radio repairs to the fact that no new sets can be bought and owners are using their old sets more listening to war news, and wants to keep them in good condition. He said his concern had been called on to repair ancient models which except for the war would still be in some basement or attic. A good many radio shops have closed, as the owners went into war service, and this has thrown extra work on those remaining.

The concern expects to go back into selling after the war, but will also maintain its service department. And as the name indicates the Chapman brothers expect to have a hand in the sale and service of television as soon as it gets "around the corner."

Service for Sealed System Refrigerators

(*Continued from page 25*)

inals. See that there are no bare wires or shorts.

"Unit Trips Relay Overload"

Correction: Change relay.

Several cases have been found where the relay overload was weak and would not operate the compressor, even though the electric current flow was normal.

"Noisy Unit"

Before changing a unit that seems to be extremely noisy, examine every part of the system as it is applied to the cabinet, for cause of noise; check the tubing to see that it is not touching some metal part, such as a part of the air duct. The condenser may be touching something or it may be loose on its mounting. Check the mounting of the compressor; a spring may be loose or broken. In other words, check all sources of external noise before removing the unit.

The simplest way to check any sealed unit, when there is doubt as to whether or not a unit failure or an accessory failure exists, is to isolate the compressor immediately with a factory calibrated relay and service cord assembly to see if the compressor will run. If the compressor runs, changing the unit will not help your difficulty. Check the electrical circuit, relay, fan motor, light assembly, service cord and thermostat. Be on the lookout for wires with frayed ends, as these will cause short circuiting.

If the compressor will not run with a calibrated relay, check the line voltage to see that there is not more than a 10% variation from the normal voltage for which the unit was designed. If the voltage is correct and the unit will not run; change units. Be very careful in carrying the calibrated relay, as a slight shock can ruin its calibration.

Use and Maintenance of Electrical Instruments

(*Continued from page 36*)

er factor, the three-phase power is the sum of the two readings; below 50% power factor, it is necessary to reverse the reading of one wattmeter (by reversing its current leads) and then take the difference between the readings of the two instruments. The accuracy of tests made with single-phase wattmeters will be somewhat higher than those made with polyphase wattmeters. Voltage ranges can be extended by the use of multipliers or transformers. For high accuracy, use the instruments at 40% of rated current or above.

These connections, made exactly as shown, are correct at all power factors. Polyphase power-factor meters are intended for use in balanced circuits only. Single-phase power-factor meters should be used only at the calibrated frequency.

Frequency meters are connected as are voltmeters (see Figs. 6 and 8). Built for use on 110/120-volt circuits, they should not be used on voltages greater than 150 volts. Above 150 volts, a variable-voltage autotransformer or a potential transformer should be used. Resistance multipliers must not be used.

Following are a few observations that apply to direct current measurements.

If one side of the line is grounded, ammeters should be connected to that side.

Shunts are used with millivoltmeters (Fig. 28) to measure large current values. If the instrument reads backwards, reverse the instrument leads.

Always connect a d-c voltmeter across the load—never in series. See Figs. 29 and 30.

How Modern Warfare Consumes Copper

Modern warfare consumes copper in quantities so vast as to be beyond the comprehension of the average individual.

To illustrate the vital role played by the metal, H. W. Clough, vice-president of the Belden Manufacturing Company, chose some data from only one branch of the combat services—the Navy—for this analysis.

An aircraft carrier requires upwards of 2,000,000 pounds of copper; a destroyer needs approximately 380,000 pounds; the small but deadly PT boats incorporate some 12,000 pounds; in one minute of combat 50 fighter planes shoot away 14,000 pounds of the metal; 500 of certain types of anti-aircraft guns discharge 3,000,000 pounds during one hour of operation. Last year approximately 1,800,000,000 pounds of brass (containing approximately 1,200,000,000 pounds of copper) went into cartridge cases alone. This quantity of copper is sufficient for enough household lamp cords to reach to the planet Venus at its minimum distance from the earth — approximately 25,000,000 miles!

Virtually every article of war, whether it is for direct combat use or equipment for industries producing for combat, requires copper in some form, Mr. Clough pointed out.

UNSUNG HERO

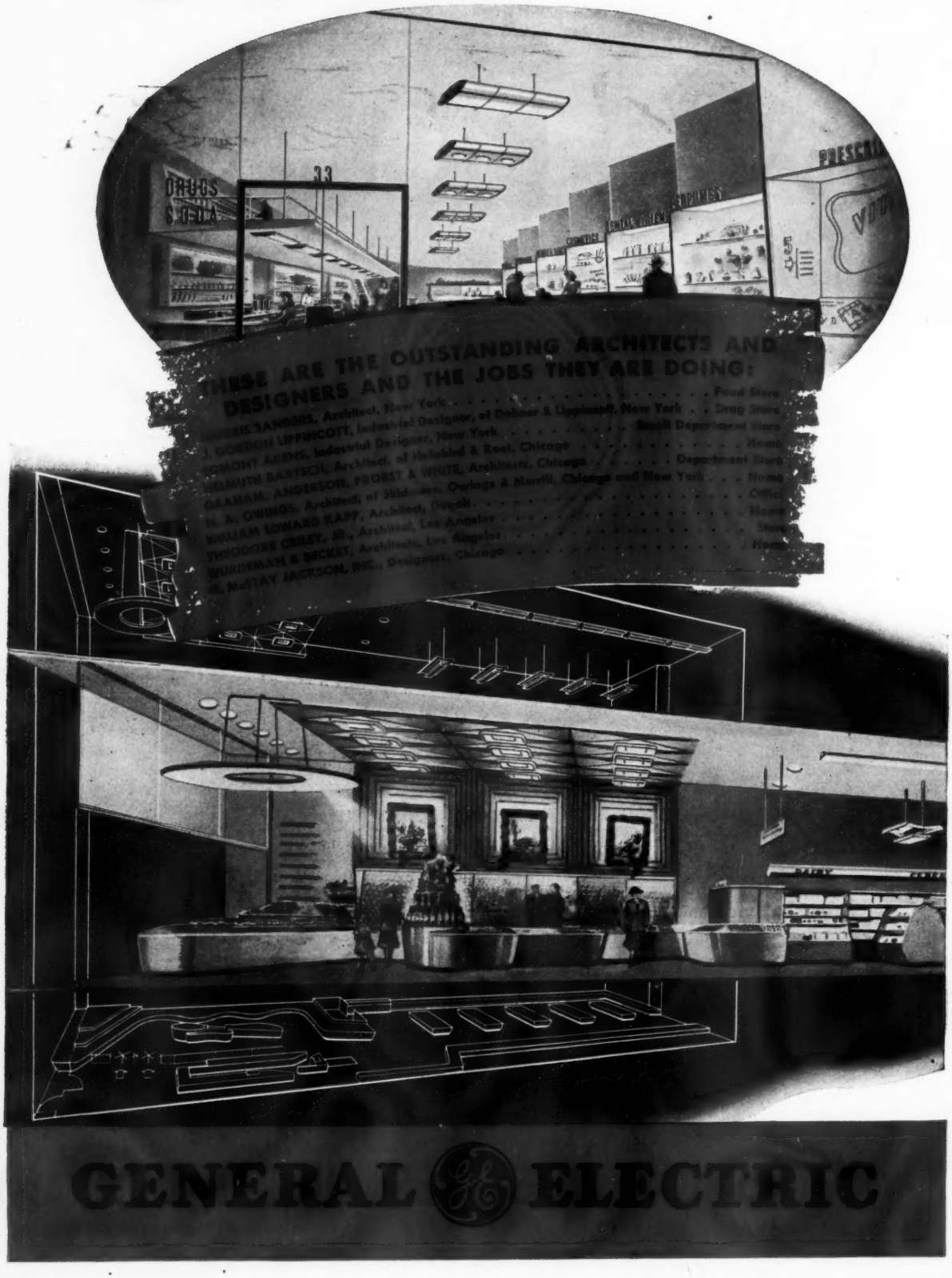
From boyhood on, almost everyone who likes to work with his hands has taken friction tape for granted. Today, the unsung hero, Security Friction Tape, is being called on more than ever before... for emergency repairs everywhere... and to help keep irreplaceable equipment working at home.

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE · ROCKEFELLER CENTER · NEW YORK 20, N. Y.

IN CANADA: DOMINION RUBBER CO., LTD.

G-E PAVES THE WAY FOR


DRUGS
33
THESE ARE THE OUTSTANDING ARCHITECTS AND DESIGNERS AND THE JOBS THEY ARE DOING:
MORRIS SANDERS, Architect, New York . . . . . Food Store
J. GORDON LIPPINCOTT, Industrial Designer, of Dohner & Lippincott, New York . . Drug Store
EGMONT ARENS, Industrial Designer, New York . . . . . Small Department Store
HELMUTH BARTSCH, Architect, of Holabird & Root, Chicago . . . . . Home
GRAHAM, ANDERSON, PROBST & WHITE, Architects, Chicago . . . . . Department Store
H. A. OWINGS, Architect, of Skidmore, Owings & Merrill, Chicago and New York . . . Home
WILLIAM EDWARD KAPP, Architect, Pasadena . . . . . Office
THEODORE CRESEY, JR., Architect, Los Angeles . . . . . Home
WURDEMAN & BECKET, Architects, Los Angeles . . . . . Store
S. McSTAY JACKSON, INC., Designers, Chicago . . . . . Home
DAIRY
GENERAL ELECTRIC

POSTWAR LIGHTING PROGRESS!

GENERAL ELECTRIC BRINGS TO THE LIGHTING INDUSTRY THE CREATIVE IDEAS OF FAMOUS ARCHITECTS AND DESIGNERS FOR BETTER COMMERCIAL AND RESIDENTIAL LIGHTING

THE postwar store, office and home offer the greatest opportunities for lighting progress in the history of the lighting industry. About 1,500,000 commercial establishments and some 600,000,000 sq. ft. of office space will be ready for better lighting; about 10,000,000 new homes will be needed to bring housing demand into balance with supply in the decade after the war.

To supply these markets with the kind of lighting that sets new standards of comfort and attraction will require development of new and improved lighting techniques. General Electric now offers the lighting industry a comprehensive program to stimulate this development.

G-E Enlists Outstanding Talent

Ten famous architects and designers have been retained by G-E to work out creative ideas for better lighting. Their assignments will cover small and medium-size stores, offices, and low and medium-price homes.

Their plans and suggestions will be made available:

1. To other architects, so that new lighting tools and techniques will become familiar to the entire architectural profession.

2. To fixture manufacturers, so that they may develop lighting units that are acceptable to architects and designers and at the same time efficient and easy to make.

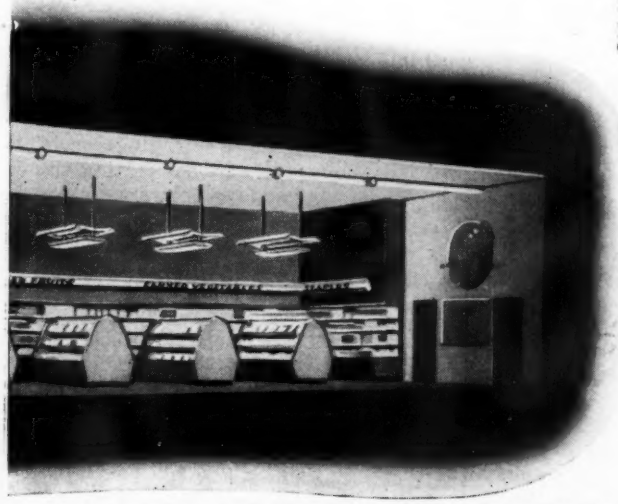
3. To distributors, contractors and lighting companies.

4. To the potential buyers of better lighting, so they may have a wider appreciation of modern lighting practice.

To Promote Lighting Progress

We believe this new G-E program will help the lighting industry give the postwar buyer the benefit of the best planning, the best thinking, and the most effective lighting the industry can provide.

Suggestions for lighting the food store shown at left are described in a new booklet now ready. For your free copy, write Dept. 166ES-E, General Electric, Nela Park, Cleveland 12, Ohio.



A comprehensive G-E advertising program *will bring the work of these outstanding men to all interested groups. An advertisement featuring the food store, for example, appears in the April issues of Architectural Forum, Architectural Record, New Pencil Points, Chain Store Age (Adm.), Progressive Grocer, National Grocers Bulletin and Super Market Merchandising.*

Hear the General Electric radio programs: "The G-E All-Girl Orchestra," Sunday 10 p. m. EWT, NBC; "The World Today" news, every weekday 6:45 p. m. EWT, CBS.

THE BEST INVESTMENT IN THE WORLD IS IN THIS COUNTRY'S FUTURE—BUY WAR BONDS

"TO MAKE LAMPS STAY BRIGHTER LONGER"
The Creed of G-E LAMP RESEARCH

G-E MAZDA LAMPS

NEWS of the INDUSTRY
National and Southern

1,000 Attend Washington Electric Institute Meeting

ERIC JOHNSTON, president of the Chamber of Commerce of the United States, was the principal speaker before 1,000 representatives of the electrical industry and other business executives who attended the 10th Annual Meeting of The Electric Institute of Washington, held at the Statler Hotel, Tuesday evening, March 21st. (Mr. Johnston's address appears elsewhere in this issue.)

Dr. William McClellan, chairman of the board, Union Electric Company of Missouri, and one of those responsible for the inception of The Electric Institute, stressed the very special opportunity for the expression of individual initiative which is afforded executives of electric utilities.

He pointed out that utility companies, unlike other businesses, operate as a monopoly under special franchise from municipalities or other governmental units and also that the utility is performing a function for the community which that community could provide for itself. "Therefore," he said, "the utility is obligated to provide a service for the community which would be better and cheaper than the community could provide for itself; otherwise, the threat of municipal or public ownership would become a reality.

"One of the greatest difficulties confronting the executives of electric utilities, is to avoid the possible complacency which may come with the operation of a monopoly which offers a service essential to a community. In other businesses, customers can select the bank, the store, the factory which they think serves them best; in a monopoly, the customer has no choice and all he can do is complain either to the company or to the regulatory commission. It is very easy, therefore, for utility executives to rest on their laurels, to provide less than completely satisfactory service, and to continue operations under old methods and former practices."

A. G. Neal, President
Potomac Electric Power Co.

A. G. Neal, president of the Potomac Electric Power Company, stated that "since the electrical industry's first power house was built, the utility has been dependent upon other branches of the industry for light bulbs, appliances and equipment through which it could render service to the public. The Potomac Electric Power Company has always recognized a responsibility to its customers considerably beyond the end of its distribution system and has advised its customers as to the type of equipment which would best serve their needs, as well as how best to make use of that equipment after it was installed.

Mr. Neal then outlined the conditions which preceded the organization of the Electric Institute ten years ago. "Some power companies throughout the country," he said, "had been forced out of merchandising by legislation; some had retired from appliance selling to improve public or dealer relations; others had adapted their merchandising practices to stimulate appliance sales through normal retail channels.

"Prior to the organization of the Institute, the company had a complete freedom of choice between aggressive, direct merchandising, a halfway position of power company merchandising with dealer help, or a non-merchandising operation with power company promotion directed through a cooperative industry organization. After months of studying the local market, it was determined that the institute should be organized and that the Potomac Electric Power Company should discontinue its direct merchandising."

J. S. Bartlett, managing director of The Electric Institute, commenting on the results of cooperative effort, described the "shopping center where nothing was for sale," which was organized as a part of the Institute's educational program for the public, and which consisted of 10,000 square feet of exhibit space where all types of electrical merchandise were on display. In describing the postwar plans of the Institute, he stated that much of the cooperative effort of the industry in Washington would be pointed toward supporting the efforts of manufacturers and wholesalers in the training of retail salesmen, through supplementing their "product" training by training of the salesmen in the utilization of the product and in assisting him in solving his problems with individual prospects at the customer level.

The Thomas & Betts Co. Wins Second Army-Navy "E" Star

The Thomas & Betts Co., Elizabeth, N. J., manufacturers of electrical fittings received notice from the Navy Board for Production awards that its maintained high standards had earned a second star for its Army-Navy "E" flag. This is the fourth time the 45-year-old company has been hon-

ored by its government during war. During the first World War it earned the Award of Merit and in April 1943, it won the Army-Navy "E" flag. Six months later a star was added and the most recent award is the second star.

"The additional white star which the renewal adds to your Army-Navy "E" flag," wrote Admiral C. C. Bloch, chairman of the Navy Board for Production Awards, "is the symbol of appreciation from our Armed Forces for your continued untiring effort and support so necessary for victory."

Proctor Pioneers Appliance Television Demonstration

Most recent addition to the growing field of experimental television sponsors is the Proctor Electric Company, of Philadelphia, Pa., with their Proctor Playhouse, a monthly series of one-act plays tele-cast over DuMont station W2XWV. The first show, presented on March 28 was based on George S. Kaufman's popular playlet, "If Men Played Cards As Women Do," adapted to highlight the Proctor "Never Lift" iron as an integral part of the play.

Production of the show was handled by Proctor's advertising agency, Newell-Emmett Co. The professional cast included Frank Tweddell, remembered for his role as the butler in both the stage and screen versions of "Claudia," Warren Parker, veteran of 150 television shows who played George in "Of Mice and Men" and Blaine Cordner, now appearing on Broadway in "Arsenic and Old Lace" and with 110 television shows to his credit.

Although television audiences are, for the time being, limited to a few thousand homes, Proctor recognizes that with this medium it is possible to do something that has never been done before—actually demonstrate their electrical appliances in the very homes of prospective customers. By incorporating their iron and other appliances into the continuity of their program, they offer the American housewife a chance to actually see the product in operation, rather than trying to describe it with glowing adjectives. Proctor's first show indicates that a careful application of such technique furnishes fine entertainment as well as strong sales appeal.

Nashville Honors One of Its Leading Contractors

The appointment of E. Ray Edenfield, head of Edenfield Electric Co., 303 8th Avenue South, Nashville, as a member of the Nashville Electric Power Board by Mayor Thomas L. Cummins and the confirmation of this appointment by the City Council has "spotlighted" the recent outstanding achievements of Nashville's well-known electrical contractor.

Beginning in early 1942 Edenfield Electric Co. successively did the electrical work on such large military installations as Camp Forrest, Tullahoma; Army Air Classification Center, Nashville; Camp Campbell, Clarksville; and Smyrna Bomber Training Base, Smyrna; all these jobs in Tennessee beside work done at Berry Field, Nashville, and many other military installations outside of the state. On November 28, 1943, "for outstanding performance in wartime construction", Edenfield Electric Co., was awarded the Army-Navy "E".

Special commendation was given to Mr. Edenfield, particularly on one large military installation contract, for his substitution of silver for copper with a large saving of the scarce copper effected.

Active in Contractors Association

Very active in the Nashville chapter of the National Association of Electrical Contractors, as well as with the Nashville Contractors Association, an organization of sub contractors with which it is affiliated, Mr. Edenfield, upon the formation of a state organization early this year, was elected president of the Tennessee Association of Electrical Contractors.

"The mayor's appointment of Ray Edenfield to fill the vacancy on the Nashville Power Board," says an editorial in the Nashville Tennesseean, "has much to commend it. A substantial and successful business man, who knows how to read a balance sheet, Mr. Edenfield also is a graduate electrical engineer and qualified with ample experience in large electrical installations and operations. His technical information as well as his business acumen should well equip him for public service on the board."

Mr. Edenfield stands with uplifted right hand as he takes the oath as a member of the Nashville Power Board in the office of the mayor. Holding the papers and administering the oath is Judge Charles C. Gilbert and behind and between the two is Mayor Cummins. In a group of Nashville contractors at the right of Judge Gilbert, at the extreme right against the wall, is R. Lynn Farrar, secretary of both the Nashville chapter and the Tennessee Association of Electrical Contractors, as well as secretary of the Nashville Contractors Association.

IMPERIAL NEOPRENE JACKETED PORTABLE CABLES

CRESCENT

SYNTHOL WIRES AND CABLES

for long service under difficult conditions

SYNTHOL Type SN

SMALL DIAMETER BUILDING WIRE

is inherently moisture-resistant, oil, chemical and sun proof. It has the smallest outside diameter for a given copper size, permitting more conductors in a given size of conduit, is easy to fish, clean-stripping, SAFE and PERMANENT.

SYNTHOL Machine Tool and Control WIRES and CABLES

The desirable characteristics of SYNTHOL insulation mentioned above are available in a wide range of sizes and number of conductors in permanently brilliant colors, which are completely oil proof.

CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

CRESCENT
WIRE and CABLE

SOUTHERN REPRESENTATIVES

ATLANTA, GA. Edgar E. Dawes 312 Rhodes Bldg.
NEW ORLEANS, LA. Paul Hogan, Jr. 823 Perdido St.
DALLAS, TEXAS M. C. Huie Co. 707 Thomas Bldg.

BUILDING WIRE • SERVICE ENTRANCE CABLE • CRESFLEX NON-METALLIC SHEATHED CABLE • ARMORED CABLE • PERMACORD • LEAD-ENCASED AND PARKWAY CABLES • SYNTHOL WIRES • WELDING CABLES • SHIPBOARD CABLES

RUBBER POWER CABLES • VARNISHED CAMBRIC CABLES

Fluorescent Lighting Hints In Sylvania Advertising

In a new advertising campaign now running in a list of industrial and electrical trade publications and believed the first of its type ever done in the lighting industry, Sylvania Electric Products, Inc., makes public some of the know-how on fluorescent lighting acquired by this company since it pioneered the new kind of illumination.

Headlined "Fluorescent Operating Hints," the new campaign ties in closely with government efforts to make advertising more useful to the public by aiding wartime conservation. The ads convey in text, pictures and diagrammatic sketches, how to test lamps and starters, how to schedule maintenance, how to check ballasts, etc.

"Observing a few simple operating rules can prevent waste of as much as 50% of the fluorescent light you buy," says the one of the series, and then it goes on to outline in clear-cut language the steps to be taken to insure satisfactory service.

The ads are being hailed by service men and maintenance superintendents. A booklet, offered in the ads, extends additional information.

Kelvinator Service Program Key to Dealers' Problems

Continuing its "Wartime Service Program", Kelvinator will release national magazine advertising for appearance in May, June and July to help dramatize the appliance dealers' determination to keep owners "in refrigeration" and "cooking facilities" for the duration, according to C. J. Coward, Kelvinator's director of advertising. Striking color ads in leading national magazines will be used to acquaint appliance owners with the No. 1 trouble maker behind summer service calls, and urging owners of refrigerators with open type units, regardless of brand, to clean condensers and oil motors to help prevent unnecessary service calls.

The campaign will include four color insertions in the Saturday Evening Post, McCall's, Good Housekeeping, Better Homes and Gardens, American Home Household Magazine, and True Story. Further advertising is scheduled in a comprehensive list of trade periodicals.

ALL OVER THE MAP...

THERE'S A *Federal* MAN NEAR YOU!

More than ever before, service to customers is vital. Sound representation, strategically located, is an important factor in attaining this end. Fifteen nationwide branches of Federal, staffed by men who know your needs and are skilled in the knowledge of what our products can do for you, are at your call.

If you have any electrical problems involving safety switches, panel boards, switchboards or circuit breakers, please call upon the nearest Federal office for suggestions, without obligation.

FEDERAL SOUTHERN REPRESENTATIVES

—

314 Luckie St., N.W.
Atlanta, Ga.
Tel.—Jackson 2146

—

Sante Fe Bldg.
Dallas, Texas
Tel.—R-4013

Federal ELECTRIC PRODUCTS COMPANY INC.
50 PARIS STREET · NEWARK, NEW JERSEY
SAFETY SWITCHES · PANELBOARDS · SWITCHBOARDS · CIRCUIT BREAKERS

Kelvinator's new dealer plan book "Keeping Friends Through Wartime Service" is currently being mailed to retailers — and is predicated on the knowledge that the third war-summer presents the greatest maintenance and repair problems yet faced by dealers. It details how and where to obtain new men, how to train them, how to handle customers to obtain friendly co-operation when service calls cannot be answered promptly, and shows material of every type from dealer advertisement to customer letters and suggested telephone conversations to help the dealer over the service hump this summer.

Tieing in with the National Appliance Conservation program of "Better Care—Less Repair", Kelvinator is offering retailers two new "User's Guides", which tell housewives how to keep refrigerators and electrical ranges in efficient operation. These service booklets include a checklist of the ten-most-important-things for owners to do to help avoid needlessly calling in the service man.

Electric Alarm Clocks Distributed by G-E

In compliance with OPA and WPB rulings and directive orders the General Electric Company will begin the distribution of a limited number of electric alarm clocks within the next few weeks, according to M. B. Ross, Traffic appliance sales manager of the company's Appliance and Merchandise Department.

Recent government-sponsored surveys have shown the critical need for alarm clocks and material has now been released for the production of as many clocks as possible without interfering with war orders. It has been pointed out that, although as many clocks as possible will be manufactured, their production necessarily will fluctuate because of the changing requirements for military needs, and will be subject to conditions beyond the company's control.

The clocks will not carry a trade name of any manufacturer, having been designated "War Alarm," which is printed on the face. Only one model will be offered for sale and it was pointed out that G-E never distributed a comparable prewar model. However it carries a regular standard guarantee and is not of inferior quality. Except for minor non-operating parts, the materials are the same as those in prewar-model clocks.

General Electric's regular prewar distributors will receive the first shipments shortly, and retailers will be able to offer the clocks for sale to the general public after May 1.

The WPB has established quotas for each geographical area within the United States, based on the distribution of electric clock sales in 1941, and adjusted to compensate for population shifts since that year, as indicated by Department of Commerce figures. Within each geographical area the number of clocks to be distributed is based on the 1941 purchases of the distributor in that area in relation to the company's 1941 sales.

Hotpoint Advertising Enters New Phase

Appliance retailers anticipating the many problems they face in postwar, changing business procedures from wartime activities to appliance selling, will be interested in the technique by which Hotpoint is preparing for transition of its wartime advertising theme.

Changing from the "Bondwagon" appeal, the new emphasis is being placed on details of postwar electric kitchen design, according to H. E. Warren, advertising manager. This permits a continuance of the "Buy Bonds" appeal, but brings new emphasis to the "Plan now for that Electric Kitchen" appeal which must be used now to keep interest alive, he said.

Speaking before a sales division planning conference of Edison General Electric Appliance Company, the Hotpoint advertising man pointed out that War Bond advertising of industrial concerns which features the ear-marking appeal — "Save with War Bonds today—to buy that new convenience tomorrow," has gained the greatest popularity of any type of advertising, according to recent consumer surveys. However, Hotpoint advertising, which has carried this theme throughout the war, is now shifting the emphasis to tie in more closely with the aims of its dealers, while retaining the basic theme.

"At the beginning of the war," he said, "we did not elect to talk

TINY COMMUTATORS VITAL TO PLANES AND TANKS—A tiny saw cuts a slot in a copper commutator under the skillful guidance of Morene Hennon who watches her work through a magnifying glass. This delicate job is done at the Lima Small Motor Division of the Westinghouse Electric and Manufacturing Company. The commutators, about the size of a man's wrist watch, are for dynamotors, small motor-generators which step up the voltage of electric power so it can be used in the radio sets of warplanes and tanks.

KELVINATOR SERVICE PROGRAM TO HELP BUILD CUSTOMER GOOD WILL!

TYING IN WITH "BETTER CARE—LESS REPAIR" PROGRAM, NATIONAL ADVERTISING SPEARHEADS PLAN FOR HOLDING AND BUILDING CUSTOMER GOOD WILL DURING CRITICAL SERVICE PERIOD AHEAD

The third war summer presents the greatest maintenance and repair problems ever faced by the appliance industry. To help boost the "Better Care—Less Repair" program, Kelvinator has built its 1944 Wartime Service program. Fully described in its plan book—"Keeping Friends Through Wartime Service"—it suggests how and where dealers can obtain new men; how to train them; how to handle customers to obtain friendly cooperation; and shows material from national magazine ads to dealer letters to help the dealer over the service hump this summer. Comprehensive and complete, the Kelvinator Wartime Service Program is offered at a time when it is most seriously needed!

BETTER CARE—LESS REPAIR is the theme of the two Users' Guides on both refrigerators and electric ranges. Each Guide tells housewives how to keep these appliances operating efficiently—gives a check list of the ten most important things to do before needlessly calling a service man.

NEW MAGAZINE ADS dramatize the utility and refrigerator dealers' determination to keep owners "in refrigeration" and "cooking facilities" for the duration. Breaking in June and July—just when the service rush will be heaviest—their big job is to gain the understanding and cooperation of customers if their service calls cannot be handled promptly. These striking color ads will appear in the *Saturday Evening Post, McCall's, Better Homes & Gardens, Good Housekeeping, Household, True Story* and *American Home!*

BETTER CARE — LESS REPAIR

LOCAL NEWSPAPER ADS that obtain the friendly cooperation of customers are available to all Kelvinator dealers, in half a dozen economical sizes. These personalized "Better Care—Less Repair" ads take customers into the dealers' confidence, ask their help by playing up the free "Users' Guides."

Awarded Propeller Division, Nash-Kelvinator Corporation.

LOOK AHEAD WITH KELVINATOR

DIVISION OF NASH-KELVINATOR CORPORATION

Kenosha · Milwaukee · DETROIT · Grand Rapids · Lansing

T&B QUICK GUIDE FOR
MAINTENANCE AND REPAIR WIRING JOBS

Hooking Them Up The T&B Pressure (Solderless) Way

The Lock-Tite Way to button up wiring is simplicity itself.

A glance at the guide, pictures your individual wiring requirements and identifies the correct Lock-Tite Connector for the job.

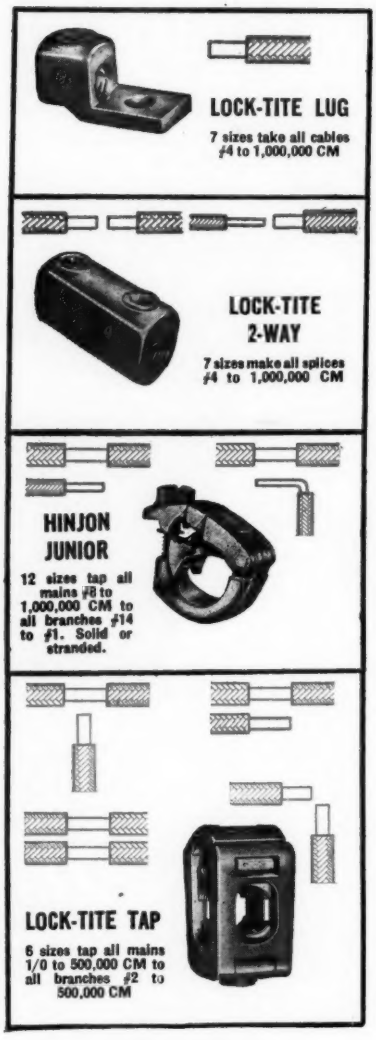
Each Lock-Tite fitting is so versatile that it takes a wide range of overlapping cable sizes, and thereby saves stocking a miscellaneous assortment of seldom used pieces.

They are engineered to take solid, stranded, flexible, extra flexible, hemp-core, rod or tubing.

All Lock-Tite Connectors are one piece construction with no loose parts. A positive locking disc assures reliable performance under continuous severe vibration. Being solderless, they are a perfect cinch to install with key wrench or screw driver. Fully salvageable. Approved by Underwriters Laboratories.

The Lock-Tite way of wiring helps the maintenance and repair man to put the juice back on, and keep it on.

For prompt delivery, order the Lock-Tite Connectors from the stock of your local T&B Wholesaler. We distribute exclusively through his competent service organizations.


LOCK-TITE LUG
7 sizes take all cables #4 to 1,000,000 CM
LOCK-TITE 2-WAY
7 sizes make all splices #4 to 1,000,000 CM
HINJON JUNIOR
12 sizes tap all mains #8 to 1,000,000 CM to all branches #14 to #1. Solid or stranded.
LOCK-TITE TAP
6 sizes tap all mains 1/0 to 500,000 CM to all branches #2 to 500,000 CM

For complete Lock-Tite Maintenance and Repair Bulletin, Contact your T&B Distributor or write nearest T&B Office.

The Thomas & Betts Co., Inc.,
513 Masonic Temple Bldg.,
New Orleans, 12, La.

The Thomas & Betts Co., Inc.,
P. O. Box 2372,
Charlotte, North Carolina.

The Thomas & Betts Co., Inc.,
Room 423,
Citizens & Southern Bldg.,
Atlanta, 3, Ga.

THE THOMAS & BETTS CO.
INCORPORATED
MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899
ELIZABETH 1, NEW JERSEY
In Canada: Thomas & Betts Ltd. Montreal

E Flag awarded April, 1943
White Star awarded October, 1943

about our war production, although our plants were doing 100 per cent war work. We felt that we could help the war effort immediately, and our dealers ultimately by getting behind bond sales.

"The response among dealers, the public and even the U. S. Treasury, proved that the campaign was correct. Today War Bond sales are as necessary as at any time during the war, and it is because we realize this that I shall explain the next step, the transitional phase, in detail; for it is here that our own interest and our dealer's interest appear.

"When we pioneered the copy theme 'save with War Bonds for that kitchen tomorrow,' we were aiming at the strongest self-interest motive we knew of for Bond buying. Now, after establishing the electric kitchen as the reward for Bond buying by more than two years of repetition, a fresh and stronger appeal is being added, so that our new messages tell more about the kitchens which will be available in postwar. We feel that this is a natural development of the copy theme, and adds new vigor and increased interest to the series."

Warren said experience shows that when a product has been off the market, or for any other reason its regular sales story has been interrupted, the time required to re-establish its advertising theme is unpredictable. Today and tomorrow, many companies face a big task of rebuilding their advertising theme because it has been absent from its regular channels for a long period. Some of these companies have suspended advertising, others have told of their war production, while still others have used inspirational or institutional copy.

"Our new advertising will feature the use of a cutaway technique, long a favorite method of the national picture magazines to portray construction detail. In using it in kitchen advertising for the first time, we are able to make Hotpoint messages distinct from those of floor coverings and other products using modern kitchen pictures in their advertising."

Premier Gets Star Award From Army and Navy

The Electric Vacuum Cleaner Co., of Cleveland, Ohio—peacetime manufacturer of Premier Vacuum

A Third CITATION

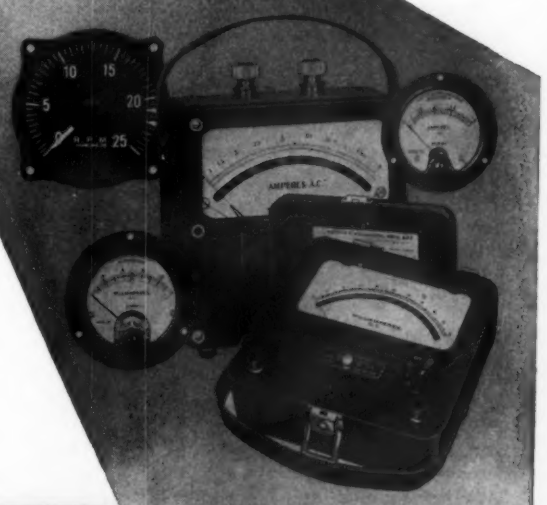
FOR THE INSTRUMENT LEADER

. . . FOR MERITORIOUS WAR PRODUCTION

This third citation for meritorious war production . . climaxing a long record of war service . . . is a source of justifiable pride to the men and women of WESTON.

The record began back in the earliest days of our defense period, when a large segment of WESTONS' capacity was assigned to the production of instruments vital to military needs. Thus, when we finally were forced into this world struggle, WESTON was ready for *full-scale war production.*

This new star which adorns our "E" pennant marks the *third* time WESTON has been *first* in this highly specialized field to receive each successive war citation. Weston Electrical Instrument Corporation, Newark 5, New Jersey.



Laboratory Standards . . . Precision DC and AC Portables . . . Instrument Transformers . . . Sensitive Relays . . . DC, AC, and Thermo Switchboard and Panel Instruments.

WESTON

Specialized Test Equipment . . . Light Measurement and Control Devices . . . Exposure Meters . . . Aircraft Instruments . . . Electric Tachometers . . . Dial Thermometers.

FOR OVER 55 YEARS LEADERS IN ELECTRICAL MEASURING INSTRUMENTS

Cleaners and currently the manufacturer of wartime equipment for the Army and Navy—has recently been awarded a white star to add to the Army-Navy "E" flag that flies over the plant. The star signifies continued excellence in the production of war equipment.

Birmingham Jobber Reports Industrial Sales Higher

The Mayer Electric Supply Company, wholesale distributor of electrical supplies and fixtures, of Birmingham, Ala. has grown steadily since it was established 10 years ago. It travels two men covering all Alabama and part of the Florida and Mississippi Gulf coast where important shipbuilding activities are now centered.

Ben S. Weil, manager, reports that the concern's business was pretty evenly divided in normal times between industries and contractors but now service to industries predominates since many of them are engaged in war work which requires electrical supplies and replacements.

The Mayer Company takes pride in the variety of stock carried in wiring devices and starters as it represents a great number of independent manufacturers and thus has a varied source of supply. It has been able in recent months to supply many hard to get items to its clients.

Manager Weil said surveys made to date show there will be an unprecedented demand for electrical fixtures and supplies after the war. One reason for this has been the critical nature of this merchandise during the war which has resulted in the building up of quite a backlog of needed building, repairs and replacements. He expects fluorescent lighting to take precedence in commercial and industrial lighting.

Dealers Show Interest In "U Plan for V Day"

One of the most comprehensive studies of dealers interest in postwar planning in response to Landers, Frary & Clark's "U" Plan for "V" Day has been developed. Over 40% of the 25,000 dealers requesting plan books earlier in the year have signed up for the promotional package and it is believed at least 25% more will become official "U" Planners by June 1st, according to Universal officials.

Government News and Views For the Electrical Industry

Repairmen Urged to Plan For Summer Service Rush

Refrigeration service shops should prepare now for the heavy demand for their services that is expected to develop this summer, the War Production Board announced recently.

To render the best possible service during their peak demand period, it is necessary that these shops have sufficient materials and parts on hand or available in a supplier's warehouse, WPB said. They must also have adequate labor and transportation.

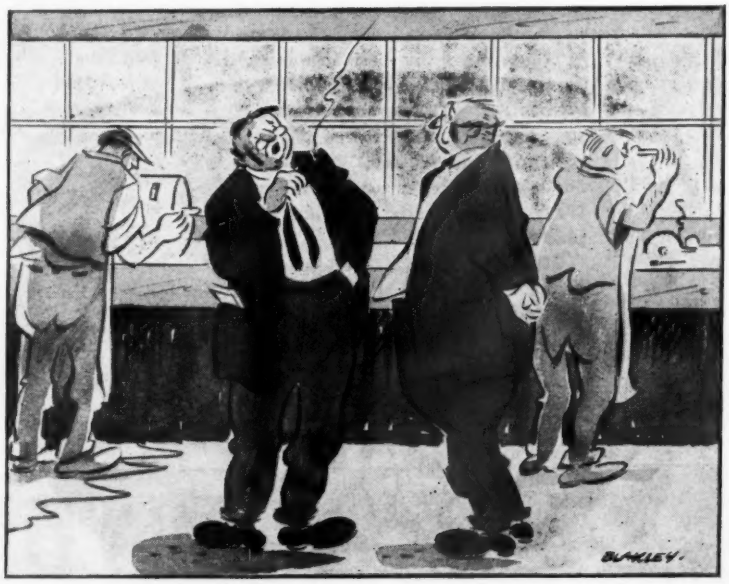
The procedures that should be followed by these repair shops to obtain the necessary parts, material, labor and gasoline and tires for transportation have been pointed out by the Electrical and Mechanical Repair Shops Section of the Office of Civilian Requirements. They are as follows:

Parts and Materials

Orders should be placed now for future delivery of parts and materials which repair shop operators know will be required in their service business this summer.

A procedure has been established for obtaining parts requiring ratings and materials requiring an allotment symbol, WPB explained. Controlled Materials Plan Regulation 9-A provides a method for repair shops to obtain parts and materials for domestic refrigeration repair services. Order P-126 makes provisions for repair shops to obtain necessary parts and materials for commercial and industrial refrigeration repair services. These orders should be supported by the proper allotment symbol or preference rating, and if one supplier is unable to fill the order, other sources of supply should be investigated.

Parts and materials for domestic refrigeration repairs have been difficult to obtain in the past, but recent developments have begun to relieve this situation, WPB said. Many repair shops which formerly have placed orders and were unsuccessful in having their orders filled have assumed that those particular parts or materials are simply not available. This is the wrong assumption, WPB said. Orders should be placed again since



"The research people at Schenectady and East Pittsburgh told me it couldn't be done! Well, Sir, I put my boys to work on it—and it couldn't!"

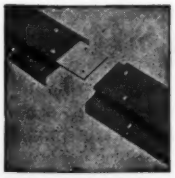
New HOLDENLINE CHAN'L-RUN

ready for immediate delivery

INDIVIDUAL UNITS OR CONTINUOUS WIREWAY

As pioneers in industrial fluorescent lighting, HOLDENline presents its new Chan'l-Run in *continuous wireway* or *individual units,* with pride and confidence born of experience, plus an engineering lighting background. A study of HOLDENline *Chan'l-Run* reveals the sound engineering principles that contribute strength, simplicity and lighting efficiency.

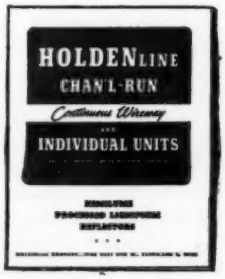
Its flanged steel channel is the strong backbone of HOLDENline *Chan'l-Run* in both continuous run wireway and individual units. Its advantages in continuous run lighting are speed in installation, saving in wire and labor, plus ease of hanging and maintenance. Steel limitations have not impeded the design of these fixtures, instead they have stimulated an efficient combination of lightness with strength.



METAL PLATE that firmly joins one section to another for continuous runs.

HANGER STRAP that slips over Chan'l-Run flange, grips firmly and easily and permits positioning of strap at any convenient point on each section except where outside ventilated ballast is mounted.

Note the versatility of the Hanger Strap which serves equally well for pendant, chain or cable suspension.



Send for Catalog T-44. *Gives full details, sizes, prices, weights and lighting efficiencies in detail.*

IMPORTANT INFORMATION!

All HOLDENline Chan'l-Run and standard sections are fitted with Ligniform reflectors, Kemilume processed, giving excellent light distribution and high reflection factor.

Individual units

Two sizes for . . . 2—100-watt lamps
2— 40-watt lamps

Continuous Wireway Sections come in

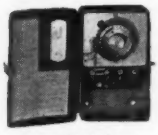
96" and 48" lengths for 40-watt lamps
120" and 60" lengths for 100-watt lamps

HOLDENLINE CO. **1960 E. 57th ST. • CLEVELAND 3, OHIO**

We Sell thru Wholesalers Exclusively

In your plant, automatic electric time controls can speed production . . . multiply manpower efficiency . . .. save countless hours. They are doing it in thousands of plants in scores of industries.

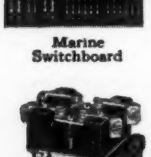
Check these facts with your top source . . . Check with Paragon, a pioneer designer and builder of time switches, industrial timers, interval timers, and time delay relay



Time Switches
300 Series

Marine
Switchboard

Time Delay Relay
800 Series



Solenoid
Type Relay

NEW SOLENOID TYPE RELAYS

Paragon has just developed a new improved Solenoid type relay, available for early delivery. Write for information.

MARINE CONTROL PANELS

As a contribution to the war production program, Paragon is building supply panels, power and lighting distribution panels, Lube alarm indicator panels, etc. Ask for a Marine Catalog.

PARAGON ELECTRIC COMPANY

409 South Dearborn St. • Chicago 5, Illinois

Paragon Chicago

BUILDERS OF ELECTRICAL EQUIPMENT SINCE 1905

the desired parts or materials may now be available.

Motors

The suggestion applicable to parts applies also to electric motors. Some new motors, although they are very scarce, are appearing on the market. In addition, some motors are available on an exchange basis through repair service stations established by motor manufacturers. If the refrigeration service shop operator will take a few "bad-order" motors to a manufacturer's service station, he may be able to obtain a few rebuilt motors in exchange. This, in itself, will be a tremendous help in meeting emergency service demands during the peak summer period. If the service shop uses this method before the summer emergency period begins, it may be able to repeat it and thereby maintain an emergency stock on hand.

Manpower

The War Manpower Commission has recognized that the manpower supply in practically all war production activities is very critical and that the refrigeration service shops have lost a large proportion of their experienced, skilled repairmen. On January 20, 1944, WMC announced that all local offices of the United States Employment Service had been instructed to take action to return to the refrigeration industry the skilled workers who have left for other employment if they are not working above the skills of the refrigeration occupation. The local USES offices were also instructed by WMC to collaborate with the Office of Civilian Requirements to put the refrigeration industry on an equitable basis with other essential activities.

The first urgent need of the refrigeration repair service industry is to train more persons in an effort to meet repair requirements during the coming months. Men not liable for military service, together with mechanically inclined women, must be trained as rapidly as possible in order to maintain repair service. Although electric refrigeration and electric motor repairmen are now on the List of Critical Occupations as published by WMC and furnished to Selective Service Local Boards for their guidance, the fact that these occupations are on this list does not mean necessarily that men in such occupations will be deferred. It merely makes them eligible for consideration as workers in critical occupations.

Temporary deferments may be obtained in some instances to permit opportunity for the training of replacements. This is an emergency measure, however, and is to be used only where services to war industry or activities in support of the war effort are threatened.

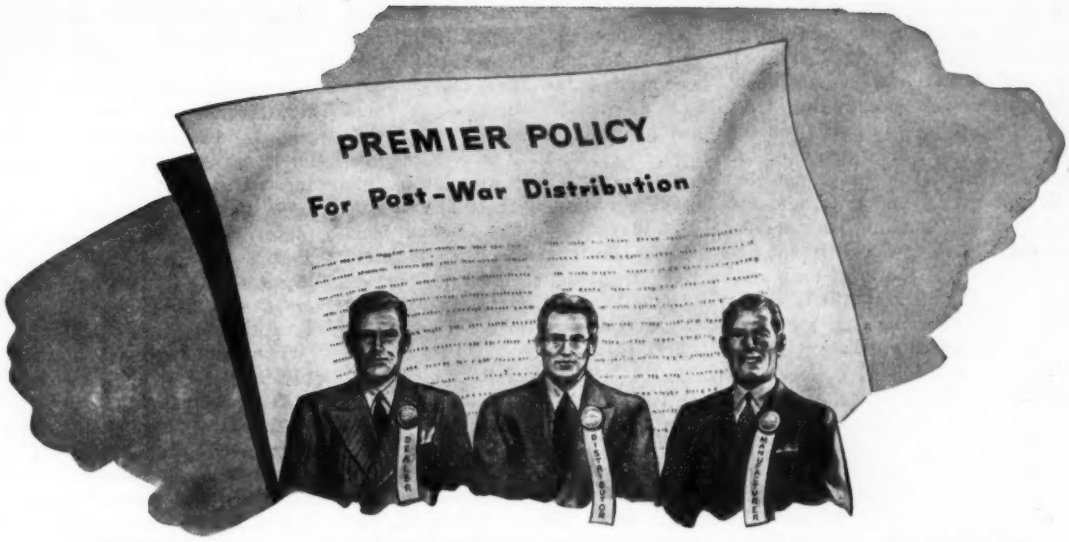
WPB Reviews Regulations Governing Repair Parts

Repair services for many domestic appliances are being greatly handicapped, the War Production Board reports because many electrical and mechanical repair shops are not taking advantage of a WPB regulation designed especially to aid them in more readily obtaining parts and materials for their operations. These items of civilian equipment include refrigerators, washing machines and other electrical appliances, as well as radios, watches and clocks, bicycles, lawnmowers, sewing machines, stoves, automatic heating plants and plumbing.

Controlled Materials Plan Regulation No. 9-A provides that these shops may purchase in each calendar quarter up to twenty tons of carbon and alloy steel, 500 pounds of copper base alloy and brass mill and foundry products, and 200 pounds of aluminum in specified forms and shapes. In addition, electrical contractors, electricians, and repairmen of electrical appliances, radios and household refrigerators may purchase in a calendar quarter up to $150 of copper wire, or one-eighth of what they used in making repairs during 1941. Under this regulation, a repairman may also buy as much other material and repair parts as he needs for his maintenance and repair work.

To buy these materials and parts a repairman need merely certify on his purchase order, in the form specfied in the regulation, that he is applying the allotment symbol of V-3 and the preference rating of AA-3 which has been assigned by CMP Regulation 9-A. This eliminates the necessity of the repairman filing WPB-541 (formerly PD-1A) or CMP 4B applications and waiting for ratings or symbols to be assigned to him.

The material may not only be



THIS TRIPLE ALLIANCE

is ready for action

AS WARTIME ALLIES, you and Premier have made the repairing and reconditioning of vacuum cleaners profitable—even under present unusual and difficult conditions. Cooperation has had a part in your success story—your energetic handling of this wartime business has had the active support and expert help of Premier through its 16 fully-staffed division offices right from the start.

Now, with the approaching switchback to selling vacuum cleaners, a new ally is joining up—the distributor who can serve you best! The addition of this vitally important partner broadens our alliance, steps up its effectiveness, increases the opportunities for success for all of us.

The right distributor—and he'll be the right one!—can offer you more frequent, more helpful service than any manufacturer's comparatively small sales staff. And the results of this close, efficient cooperation with you will increase your sales and, in turn, benefit Premier. It's a set-up with a future!

Premier's national magazine advertising will keep right on at the essential job of featuring *your* business as well as Premier's business—for in the long run that's good business for both of us. Today this advertising is urging your customers to begin talking over with you their post-war purchase-planning of appliances.

We know that this method of doing business is one that will assure success. This alliance, like any sensible one, is directly based on self-interest—the self-interest of all concerned.

GUARANTEED CERTIFIED SERVICE For Vacuum Cleaners

ARMY E NAVY

PREMIER

DIVISION

ELECTRIC VACUUM CLEANER COMPANY, INC.
CLEVELAND 10, OHIO

used for maintenance and repair work, but also for reconditioning and rebuilding a damaged or used item for resale; however, in such reconditioning or rebuilding, the item may not be improved from its original design. For example, a non-automatic iron may not be made automatic, and a treadle-operated sewing machine may not be converted to motor operation. Up to $25 worth of material may also be used to install any unit of cooking, plumbing, heating, or used air-conditioning or refrigeration equipment.

Although CMP Regulation 9-A was originally issued last November 25, letters from repairmen and a cross-country check of many repair shops has indicated that many repairmen are not familiar with the simplified form of obtaining parts and materials, WPB said. While some 100,000 repair shops are scattered throughout the country, no record of all repair shops and their locations is available, WPB said. It is, therefore, impossible for WPB to contact each shop individually to inform them of the existence of the regulation.

WPB is particularly concerned about keeping present appliances and equipment in operation since war needs make it necessary to curtail production of new products not urgently essential to war effort.

Copies of CMP Regulation 9-A may be obtained from any of the 112 War Production Board field offices, or from the Electrical and Mechanical Repair Section, Service Trades Division, Office of Civilian Requirements, WPB Washington 25, D. C.

Materials Available for Rebuilding Used Items

The procedure under which repairmen purchase controlled materials, other materials, parts, and sub-assemblies, has been amended to indicate that they may use it to obtain materials with which to recondition or rebuild damaged or used items for resale, the War Prodlction Board has announced.

The changed procedure, which is contained in CMP Regulation No. 9A, as amended April 15, 1944, redefines the term "repairmen" to include persons who recondition or rebuild damaged or used items for resale. The amendment also indicates that repairmen may use materials and parts which they purchase under the procedure to carry on such reconditioning or rebuilding. However, they may not use such materials or parts to replace material or parts which are still usable nor to replace material or parts solely to improve the original design of the article being reconditioned or rebuilt.

The amended regulation also prohibits repairmen from using the AA-3 preference rating which it assigns to obtain the following items: (1) capacitors, (2) microphones and loudspeakers, (3) resistors, (4) transformers, (5) tubes, and (6) paint. These items are made available to repairmen and retailers on a pro-rata basis without the use of ratings, and, therefore, a repairman does not need a rating to get his fair share.

The amendment modifies the forms of controlled materials which may be purchased by repairmen under the procedure to conform them to the recent revision in controlled materials designations under Schedule I to CMP Regulation No. 1.

Interpretation No. 2 to CMP Regulation No. 9A, announced at the same time, points out that distributors who sell copper tubing to automotive, heating, and refrigeration repairmen, under provisions of Direction No. 1 to CMP Regulation No. 9A, must know, or reasonably believe that his customer is such a repairman. This rule holds despite the fact that distributors who receive orders under CMP Regulation No. 9A generally are not required to find out whether their customers are complying with the Regulation, unless they know or have reason to believe otherwise.

Lighting Fixtures and Switches Get More Steel

To improve the quality and performance of safety switches, panel boards and service entrance (building ingress) equipment, the War Production Board has lifted all restrictions on the gauge of steel which may be used by manufacturers in producing enclosing cases, fronts and doors for this type of equipment.

The action is covered in an amendment to Limitation Order L-315. Prior to issuance of this

E·M·T CONNECTIONS IN A FEW SECONDS!

With B. M. Fittings

TWO QUICK SQUEEZES give you Finer, Faster Conduit Connections. B-M Fittings do away with the twisting, turning and tightening of nuts and save you valuable time and materials. Then too, they are stronger, neater and much easier to work with in tight places. Start using B-M Fittings today. Have more satisfied customers—more profits from each job!

(All B-M Fittings carry the Underwriters' Seal of Approval)

DISTRIBUTED BY

The M. B. Austin Co., Chicago, Ill.
Clayton Mark & Co., Evanston, Ill.
Clifton Conduit Co., Jersey Cy., N. J.
Gen. Electric Co., Bridgeport, Conn.
The Steelduct Co., Youngstown, Ohio
Enameled Metals, Pittsburgh, Penn.
National Enameling & Mfg. Co., Pittsburgh, Pa.
Triangle Conduit & Cable Co., New Brunswick, N. J.

Prompt Deliveries on Properly Rated Orders

BM BRIEGEL METHOD TOOL CO. • Galva, Ill.

amendment manufacturers of this type of equipment had been restricted on the gauge of steel which could be used in enclosing cases and fronts. The order also prohibited the use of doors on panel boards. This latter restriction is now lifted by the amendment.

The War Production Board also removed restrictions on the use of metal in reflectors of fluorescent lighting fixtures and removed weight limitations on ferrous metal used in other parts of these fixtures.

This action, taken by an amended version of Order L-78, is in line with WPB policy of re-substituting materials normally used when such change is warranted by the material supply situation, and will result in a better product and a saving of manpower. Removal of restrictions on metal in reflectors and of weight limitations on ferrous metal in other parts of fixtures will save considerable manpower in manufacture and installation of fixtures.

Hardwood, which is now scarce, has been used for reflectors since metal was prohibited in October, 1942. The return to metal reflectors will save estimated 10,000,000 square feet of hardboard per year, Building Materials Division officials said.

Permitted use of aluminum in industrial type lighting equipment (including industrial type fluorescent) was established by Order M-1-i (Aluminum) as amended March 24, 1944.

L-78 as amended is effective immediately. However, Division officials pointed out, manufacturers will require from 60 to 90 days to make deliveries of the new types of fixtures in any substantial quantities because of the current sheet steel delivery situation and the time required to get the steel into production.

Restrictions on the use of metal in fluorescent lighting fixtures were further relaxed on April 14 by the War Production Board. Order L-78, as amended and effective April 21, removes former prohibitions on the use of metal to close the ends of reflectors, and in shields, louvers, and baffles.

Transformer Shortage Brings New Curtailments

The installation of new electric connections, both urban and rural, has been curtailed to protect productive capacity required for the manufacture of radio and radar transformers for direct military use, the Office of War Utilities of the War Production Board announced today.

New urban extensions may no longer be built by electric utilities to provide service to consumers if the installation will require distribution transformers of size five KVA (kilovolt amperes) and smaller. This restriction is made effective by changes in existing utilities orders of the War Production Board. Rural extensions are affected by changes that narrow the basis for estimating the productivity of farms seeking electric service.

Radio and radar transformers are manufactured with the same facilities and labor as small distribution transformers for electric utilities. The Office of War Utilities recently imposed stringent controls over placement by utilities of purchase orders for all new transformers, sizes five KVA and smaller.

Additional changes in utilities orders U-l-c, U-l-d, U-l-f and U-l-h, made simultaneously with the changes arising from the transformer shortage, are designed to improve the administration of the orders. Significant changes accomplish the following: Modify restrictions on extensions of gas and electric services for cooking purposes; permit extensions of utilities to all types of commercial and industrial consumers, including such consumers as wholesale and retail establishments, physicians' offices and restaurants; revise and simplify the utilities construction standards called for by U-l-f.

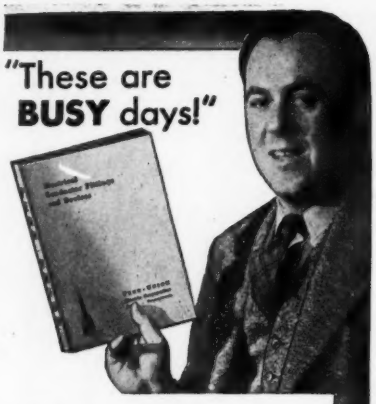
"Is it true that's what you're paying him for—to inspect?"

Ballast Production Curtailed

The lighting fixture ballast and transformer industry has voluntarily curtailed production of types and sizes not in general demand, the War Production Board reported early in April. This fact was brought out at the recent meeting of the industry's Advisory Committee, at which types now in production were reviewed.

Ballasts and transformers are electrical devices used in operating fluorescent lighting fixtures. Ballasts are used for hot cathode lamps and transformers for cold cathode lamps. Approximately 25 types of ballasts for hot cathode lamps and 10 types of transformers for cold cathode lamps are being produced, representing an over-all reduction of about 60 per cent in the number of types and sizes formerly made.

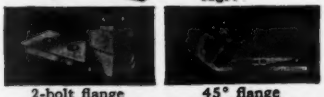
The trend in production, Committee members said, is toward an increase in 15 and 20 watt balasts and a decrease in 100 watt ballasts. WPB officials said that military and essential civilian requirements for 1944 call for production amounting to a dollar value volume of about $10,000,000.



SAVE TIME—select your conductor fittings from this Catalog . . **ALL** good types

You can buy Tee Connectors, Grounding Clamps, Cable Taps . . . Straight, Parallel, Elbow and Cross Connectors . . . Service Connectors, Bus Supports, Terminals . . . *practically every good type, in the COMPLETE line.*

JUST FOR EXAMPLE— here are some of the standard Penn-Union Vitite terminal lugs:



2-bolt flange | 45° flange

Side flange | Center tongue

Round, 45° | Round, 90°

Round, offset | Round, center

These types and many more—in a complete range of sizes. Write for Catalog.

Penn-Union connectors are the first choice of leading utilities, industrials, electrical manufacturers and contractors. They have found that *"Penn-Union" on a fitting is their best guarantee of Dependability.*

L. MORRIS LANDERS
309 Walton Building ATLANTA, GA.
WALTER J. HUEMMER
Dallas Transfer & Terminal Warehouse Bldg. DALLAS, TEXAS
PENN-UNION ELECTRIC CORPORATION
ERIE, PA.

PENN-UNION
Conductor Fittings

PERSONAL NOTES
About Men You Know

Donald M. Nelson, chairman of the War Production Board, recently announced the appointment of **Edward Falck** as director of the Office of War Utilities. Mr. Falck succeeds **J. A. Krug,** who is leaving WPB to accept a commission as Lieutenant Commander in the Navy.

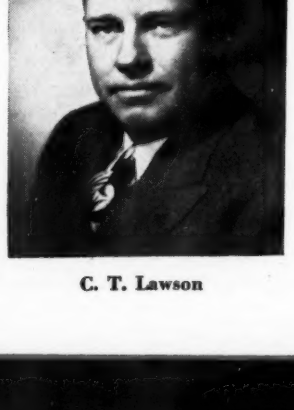
Mr. Falck has been deputy director of the Office of War Utilities since February, 1943, and since March 17 of this year has also served as executive director of the Combined Production and Resources Board. He will continue to fill the latter post while carrying his new assignment.

From 1933 to 1937, Mr. Falck was director of research and rates for the Tennessee Valley Authority. From 1937 to 1941 he was assistant to the vice president of the Consolidated Edison Company, of New York; in 1941 he came to the Office of Production Management, at Mr. Krug's request, to serve as chief of the Power Allocations Section of the Power Division.

* * *

Charles T. Lawson, general sales manger of the Kelvinator Division, has been appointed a vice-president of the Nash-Kelvinator Corporation, it was announced recently by **George W. Mason,** president.

As vice-president in charge of sales for the Kelvinator Division, Lawson's broadened repsonsibilities, according to Mason, will better enable him to plan and execute a program of expansion for Kelvinator in the major appliance field. This is in keeping with the company's recent announcement that Kelvinator expects to exceed a million units during the first years of peacetime production.



C. T. Lawson

Mr. Lawson has been with Kelvinator since 1939, only interrupting his sales activities for a period early in the war to participate in the company's extensive war production program.

Prior to joining Kelvinator, Mr. Lawson, since 1932, had been an official of Frigidaire, becoming household sales manager in 1934. He was general sales manager of The General Motors Radio Corporation in Dayton, Ohio, for three years prior to 1932.

* * *

F. C. Margolf has been appointed manager, Home Laundry Equipment Sales Division, Edison General Electric Appliance Company, effective immediately, according to **G. H. Smith,** general sales manager.

F. C. Margolf

Mr. Margolf joined the Hotpoint organization in 1937 as a specialist on home laundry equipment, having been previously with the Laundry Equipment Division of General Electric Company. Recently he has been assigned to commercial cooking equipment

work with the U. S. Government in Washington.

For the present, Mr. Margolf will retain his Washington office and continue his Government activities. Later he will be located at Hotpoint headquarters, Chicago.

* * *

Appointment of **Russell E. Ebersole** as lamp manager of the Westinghouse Lamp Division, was announced by **Ralph C. Stuart,** manager. In his new position, Mr. Ebersole will have charge of all district sales activities of the Lamp Division and will make his headquarters at the Bloomfield plant.

R. E. Ebersole

Born in Nyack, N. Y., Mr. Ebersole came to Westinghouse in 1922 as a lamp salesman in the New York District. In 1931, he became manager of metropolitan New York sales, later serving as assistant manager of the Northeastern District. In July 1942, he was appointed manager of the Middle Western District, with headquarters in Chicago.

* * *

W. T. Clawson has resigned his position as sales promotion manager of the National Electric Products Corporation to become vice president of the National Metal Products Co., manufacturers of metal and wood screens, screen doors, weatherstrips, cold-rolled steel, extruded bronze and other products. At present the company is busily engaged as subcontractors in the manufacture of formed metal products for the war effort.

Mr. Clawson, who had been with the National Electric Products Corporation for more than seventeen years, will develop postwar markets for weatherstripping and other products.

CHROMALOX HEATFLO

The only unit you need to service ANY electric range. Simplifies servicing — cuts dealer inventories.

EDWIN L. WIEGAND CO.
7600 Thomas Blvd., Pittsburgh 8, Pa.

Representatives

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C. B. Rogers,
1000 Peachtree St., N. E.

DALLAS, TEXAS
L. R. Ward,
403 Southland Bldg. Annex

RALEIGH, N. C.
W. R. Phillips

Chromalox Super-Speed range units and parts available without priority—under WPB Order L-65.

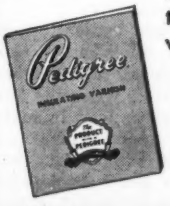
For the Best in Mechanical, Electrical, Thermal, and Chemical Protection—

Almost any kind of varnish will probably work — for a while. But, for the best service from your equipment, you need a varnish formulated to EXACTLY fit the operating conditions of your product. There's a Pedigree electrical insulating varnish that will give you longer, more dependable service in the field at lower cost.

Write today for the free Pedigree varnish catalog — or submit your problem to a Pedigree varnish specialist.

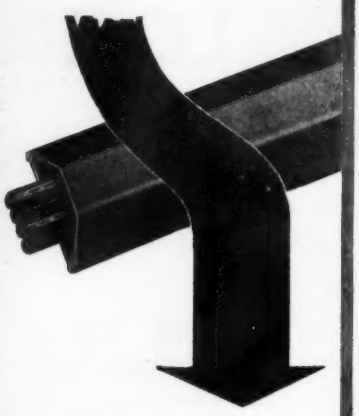
The PRODUCT WITH A PEDIGREE — THE P D GEORGE CO.

Select the Pedigree VARNISH Ideally Suited to Your Job.



The P. D. GEORGE CO.
5200 N. SECOND ST., ST. LOUIS, MO.

Call In the Pedigree Varnish Man Nearest You.



You may Safely wire on top of the floor where necessary

FLORDUCT

substantial fittings for every need . . .

National Electric
PRODUCTS CORPORATION
Pittsburgh, Pa.

NEW EQUIPMENT and MATERIALS

G-E Streamline Ballasts

To better fit the contours of lightweight fluorescent fixtures, General Electric has announced a line of Tulamp 40-watt ballasts housed in streamline, drawn-steel cases.

This new ballast is arranged for external mounting atop the fixture with leads out the bottom of the ballast case. This makes possible the installation of ballasts atop a very narrow and shallow wiring channel in an exposed position, and allows appreciable reductions in the amount of critical metal required for the manufactur of the fixture. Previously, the ballast had to be completely housed in a wide channel.

As this ballast is for external mounting, it operates in lower ambient temperatures—which contributes to long ballast life. The case has a dark-grey finish which presents a unified appearance of both ballast and fixture.

Tulamp streamline ballasts comply with all local regulations concerning power factor and do not differ electrically in any respect from conventional ballasts of corresponding ratings.

Bulletin on Megohmers

The Herman H. Sticht Co., Inc., of 27 Park Pace, New York City has recently issued a new bulletin No. 445 describing their new model C-2 Megohmer (insulation tester).

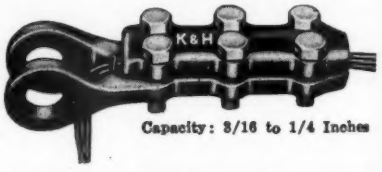
This instrument is a radically new development in as much as a new spillproof lightweight storage battery is used as a power supply for the 500 volts d-c test potential used in making insulation resistance measurements. The system employed is that of stepping up this low voltage battery to a steady test potential of 500 volts d-c by means of a special vibrator transformer circuit built into the instrument. The employment of a wet cell battery instead of dry cells as in other battery operated insulation testers gives the advantage that the battery can be readily replenished by recharging. For this purpose, a special charging circuit is also built into the instrument which makes it possible to charge the battery either from a-c or d-c at any time.

The instrument has many features, it is direct reading in megohms and ohms, has wide coverage and readability, has a sensitive meter movement with knife edged pointer and mirror scale, has a guard circuit to prevent errors through surface leakage, is ruggedly constructed, compact, and of high quality, easy to operate, and as mentioned above, the battery is rechargeable.

The instrument is exceptionally inexpensive to maintain and a special

A Live Wire is no better than its Connections

DEAD END CLAMPS
for Stranded Conductors



Capacity: 3/16 to 1/4 Inches

Made for Stranded Copper and Aluminum Steel Re-enforced, or Steel Conductor Cables

New LEAD SLEEVE feature protects each strand against abuse thru contact with each other as well as from direct contact with the gripping portion of the clamp itself. Under strain test, cables have been stretched to the breaking point without marring the individual strands held in clamp. No removable parts.

• WRITE FOR BULLETIN 12-A •

K&H KRUEGER & HUDEPOHL
Solderless Terminal Lugs and Connectors
VINE AT THIRD-ES CINCINNATI, OHIO

feature of the model C-2 Megohmer is the exceptionally low current drain from the battery, and also that the condition of charge of the battery can be checked at any time.

The Herman H. Sticht Company will be glad to mail bulletin No. 445 to any parties who are interested.

Curtis Bedford Unit

The "Bedford" units, announced by Curtis Lighting, Inc., 6135 West 65 St., Chicago 38, Ill., are designed for use in offices and drafting rooms, and for certain industrial lighting applications—either as an individual unit or for continuous rows. These units have square ends and can be joined together with flexible steel straps which hide the joints and prevent light leakage. They will usually be mounted flush on the ceiling, or recessed above it, with or without a louver. However, for some industrial installations the units can be suspended by means of chain, conduit, or cable.

The steel wiring channel is finished in gray. "Fluratex" non-metallic reflector is finished Fluracite inside, baked gray enamel outside. Dimensions are as follows: overall length —48", each additional section adding 48-1/8"; reflector—11¾" wide; height to top of ballast—7¾".

The ballast is mounted on top at the center, and starters are grouped at one end. The reflectors have square ends so the units may be joined end to end in continuous rows, using a standard connector strap and reflector joining strap. The reflector is punched for the starters, making them accessible from below.

New Pinco Catalog

A new and completely revised catalog of Pinco Standard Insulators and Fittings has just been issued by the Porcelain Insulator Corporation of Lima, N. Y. A valuable feature of the catalog is that it clearly shows the units which can be supplied under Schedule V, WPB Limitation Order L-154 of June 29th, 1943.

Shown with detailed specifications, are Pinco Pin Type Distribution Insulators; Pinco High Voltage Pin Types; Pinco Suspension Insulators; N.E.M.A. Standard Non B.I.L. and Special Switch and Bus Insulators; N.E.M.A. Standard B.I.L. Units; Guy Strain Insulators; Tree Insulators; Draw Lead-Dry Type Equipment Bushings; Indoor Bus Support Porcelain and Pinco Hardware.

T & B Electrical Fittings

Bulletin 522 gives engineering details on all phases of the T&B Sta-Kon Disconnect way of wiring. This system of wiring is based on a tip which is applied to ends of wires by standard Sta-Kon pressure tools. No solder required. Two identical tips meet in a Beryllium Copper spring coupler. Countless varieties of quickly disconnectable electrical devices can be designed around these basic parts. Many of these devices, includ-

No Priority Required
FOR "LLOYD"
Fluorescent Starters

● ● ●

SHIPMENTS MADE FROM MIAMI STOCK SAME DAY ORDERS ARE RECEIVED. STANDARD LIST PRICES AND DISCOUNT. WIRE YOUR ORDERS COLLECT TO

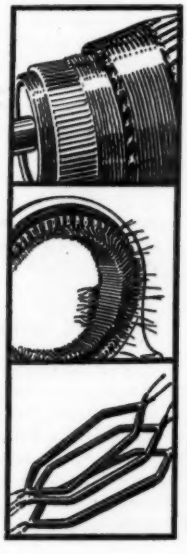
Jules J. Dreyfuss & Sons
"A Live Selling Organization"
1404 N. W. 7th Ave. Miami 36, Fla.

C. B. ROGERS

ELECTRICAL HEATING ENGINEER
CHROMALOX
ELECTRICAL HEATING UNITS
and
CHROMALOX
EQUIPPED PRODUCTS

1000 PEACHTREE STREET
ATLANTA, GEORGIA

PROTECT WINDINGS
— USE —
DOLPH'S Insulating Varnishes



You will find a complete line of DOLPH'S Insulating Varnishes to meet all your requirements. Whether you desire baking or air drying varnishes or red oilproof enamels, you can be assured that you are getting quality products plus extra protection when you specify DOLPH'S.

Why not let us help you select the proper grade of varnish for your particular type of work? We will be glad to answer your questions and supply you with information on any phase of uses and applications of insulating varnishes.

JOHN C. DOLPH COMPANY
Insulating Varnish Specialists
168 EMMETT STREET, NEWARK 5, N. J.

KEEP MOTORS RUNNING WITHOUT DISMANTLING!

IDEAL RESURFACERS

At first signs of wear on Commutators and Slip Rings—(pin ridges, tiny sparks, pits and burns) —use IDEAL Resurfacers to refinish to a smooth highly polished surface, without disassembling. Keep motors and generators on the job.

IDEAL Portable Precision Grinders

Use when surfaces are badly grooved, scored or out-of-round. Attach to motor frame. Grind at normal operating speeds.

IDEAL Portable Mica Undercutters

Undercut hardest Mica. Three models to fit all conditions.

COMPLETE LINE OF MOTOR MAINTENANCE TOOLS

Send for FREE copy of NEW Handbook 88-pages of descriptions and illustrations of Motor Maintenance, Repair and Safety Equipment.

Sales Offices in All Principal Cities

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Carbon Products

Multiflex Brushes
Give
Better Commutation
Longer Life
Less Commutator Wear
That Extra Demand Required
Better All Around Performance

HELWIG COMPANY
2544 NORTH 30th ST., MILWAUKEE, WIS.
Southern Offices:
724 North Hudson, Oklahoma City, Oklahoma
Telephone: 3-3409
2005 McKinney Avenue, Houston 3, Texas
Telephone: Preston 1610

ing disconnectableo two-way splices, three and four way splices, disconnect terminals, disconnect strips, blocks, and others are pictured and described in this new booklet. The Thomas & Betts Co., Inc., 36 Butler Street, Elizabeth 1, New Jersey, will be glad to mail a copy of this new bulletin to anyone interested.

New J-M Sealing Compound

Johns-Manville announces the addition of Uniseal, an all-purpose sealing compound, to its line of plastic sealing compounds. It will be available to Johns-Manville distributors as well as to general industrial accounts.

Under laboratory tests and field conditions Uniseal has proved especially effective as a seal against weather and water absorption. Also it is highly resistant to vapors, fumes and to heat hardening. For convenience in handling and marketing, it will be packed in one and five pound pugs, in cartons of sixty and twelve respectively.

Westinghouse Power Centers

For quick installation in war plants, shipyards, hospitals, and similar applications, Power Centers—compact, coordinated unit substations available in all standard ratings—are discussed in a new booket announced by Westinghouse Electric and Manufacturing Company.

The new 25-page booklet contains a timesaving guide to the selection and specification of indoor and outdoor transformer installations, including coordinated disconnect and protective equipment. Standard arrangements are suggested to fit the various types of distribution systems.

Factory-assembled and tested, Power Centers combine all transformer and switching material in one unit. They save time, labor and critical materials. With this booklet, complete substations can be selected that will require no additional parts or protective vaults. Other advantages listed in the booklet are minimum space requirements, and added safety.

A copy of the new booklet (B-3224) may be secured from Department 7-N-20,, Westinghouse Eectric and Manufacturing Company, East Pittsburgh, Pa.

Recessed Indicating Light

The Graybar Electric Co., who distribute through their 90 offices in the United States, the products of The H. R. Kirkland Co., of Morristown, N. J., announce a new and interesting pilot light, made by Kirkland, for either panel or switchplate mounting called the S11 Unit.

The S11 Unit is for use with the standard S11 lamp bulb, 10 watt, available in all colors. The bulb is so recessed into the unit from the front of the panel that the tip of the bulb exposed assumes the appearance of a lens.

It is remarked that this unit provides such exterior ventilation to the lamp bulb that a much greater lamp-life is to be expected. This is an obvious advantage over a wholly enclosed lamp bulb and becomes of particular importance when the lamp is expected to be lighted for a long period of time. When compared to the use of the bulb fully exposed the S11 unit offers a considerable degree of protection against breakage and presents a streamlined appearance.

Streamlined 4-40 Fluorescent

A distinctive fluorescent design has been announced which carries a new appeal for modern lighting in administration areas, general offices and drafting rooms. The artistic "Glass and Plastic" forms are said to render enhanced appearance to any interior into which this new fluorescent luminaire is installed.

Low surface brightness is effected with high overall lighting efficiency.

YOU CAN DEPEND ON

Sepco

1915 - 1944

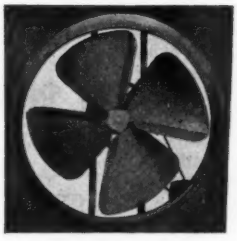
ELECTRIC WATER HEATERS

ALTHOUGH WAR TIME CONSTRUCTED THEY STILL GIVE THEIR USUAL EFFICIENT, ECONOMICAL PERFORMANCE WITH THEIR LONG LIFE LOW WATTS DENSITY HEATING UNIT, THEIR POSITIVE SNAP ACTION THERMOSTAT AND MOST EFFICIENT HEAT INSULATION MANUFACTURED AND GUARANTEED BY

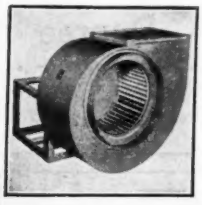
AUTOMATIC ELECTRIC HEATER CO.
POTTSTOWN, PENNA.

THE "Fresh-Air MAKER"

provides fully the comfort and ventilation so essential in army barracks, mess halls, hospitals, headquarters, theaters and other military buildings. Its fine design and sound construction meet the specifications drawn for army fans and it is particularly adaptable to the various types of installations found in army buildings.



HY-DUTY BLOWERS

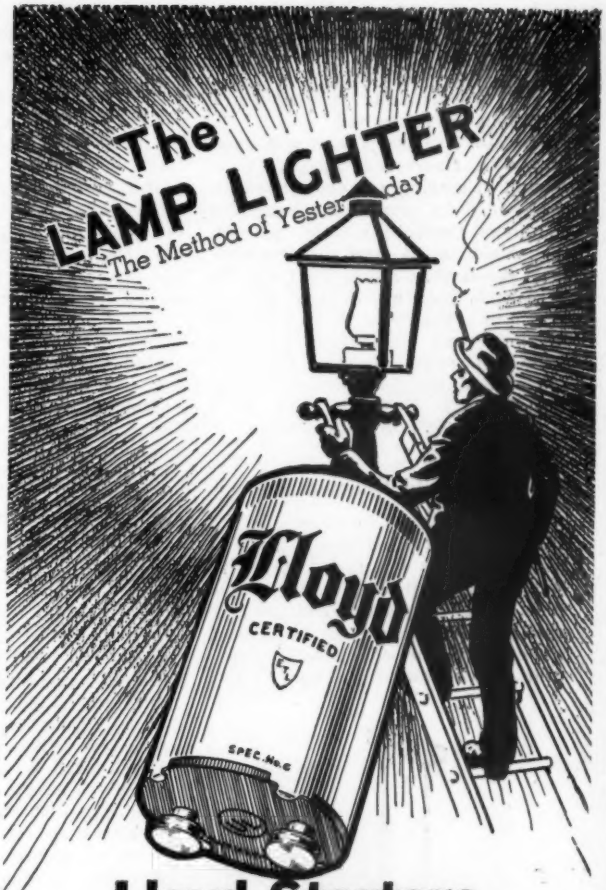


Single Inlet—Double Inlet. 400 CFM to 12,500 CFM.

Single Inlet Blower illustrated at left is particularly adapted for ventilation of mess halls in military establishments.

BLOWER DIVISION
SCHWITZER-CUMMINS COMPANY
1145 EAST 22ND STREET INDIANAPOLIS, U. S. A.

The LAMP LIGHTER
The Method of Yesterday



Lloyd Starters
Marvel of Modern Science

Light the Lamps of Industry

Engineered for perfection in quick, sure starting of fluorescent lamps, Lloyd starters are lighting the lights for millions throughout the country.

Their better performance is assured by specifications more rigid than accepted standards for material and design.

Tests conducted periodically by nationally known laboratories, confirm that the life and performance of Lloyd starters are far in excess of standard requirements.

Cat. No. 353
Lamp Holder and Starter Socket

Lloyd Starters are listed and approved by Underwriters' Lab., Inc., and Canadian Eng. Standards Assoc. Certified by Electrical Testing Lab.-Spec. 6. Certified to Fleur-O-Lier standards.

Remote Starter Socket

Cat. No. 352
Patent Nos.
D133267—2280747

LLOYD POLICY INSURES QUALITY

LLOYD PRODUCTS COMPANY
DEPT. ES-5 PROVIDENCE 5, R. I.

Representatives in 23 Leading Cities
Export Office: 13 E. 40th St., New York, N. Y.

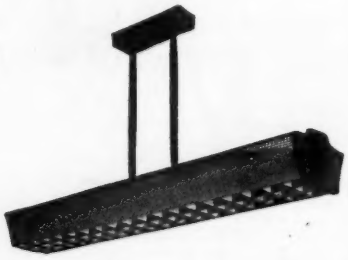
Full-screen diffusion is provided thru an exceptional diffusing-shield which consists of contiguous, multiple prisms. Direct and reflected glare conditions are minimized.

The new Excelux is used with four forty-watt fluorescent lamps. Convenient relamping (no tools needed) is provided by means of a retaining end-hinge (patented) which permits the shield to be easily disengaged from the fixture chassis. The shield is securely held within its cradle at all times. The Excelux is available for unit type installations in close ceiling and suspension models.

The new unit is manufactured by The Edwin F. Guth Company, 2615 Washington Ave., St. Louis 3, Mo.

New Wakefield Beacon

The new Wakefield Beacon, a fluorescent unit for office and drafting room, has been announced by the F. W. Wakefield Brass Co., Vermilion, Ohio. The unit is designed for high quality illumination, using etched ribbed glass for side panels to prevent direct view of the lamp. This



construction also means easy maintenance as there are no horizontal surfaces on which dust can collect. Lamp replacement is provided by a hinging arrangement of the louvers whereby lamps can be easily reached for replacement.

The Beacon has an all-steel construction with exception of the louvers. The metal end-caps are pierced in a decorative design, backed up with translucent plastic. A two-stem canopy construction using a special mounting strap reduces mounting time and cost of installation.

Ballasts are mounted in an inverted position within the channel and are only partially enclosed. This construction provides a cooler operating position with resultant less failure of ballasts from heat exposure.

The metal parts of the Beacon are finished in satin zinc providing a plated coating which prevents rusting. In addition one coat of clear enamel is applied for extra protection. Reflecting surfaces are white enamel of 88% reflectivity. Units are available with stem suspension as illustrated or with close-up mounting for low ceiling areas.

Low-Cost Electric Chain Hoist

Designed for users preferring chain hoisting, the small "Handi-Lift" developed by Harnischfeger Corporation, Milwaukee 14, Wisconsin, introduces many new features into the low price electric chain hoist field. Increased utility is claimed for the "Handi-Lift" by quick interchangeability to bolt, hook, or trolley mounting, with changeover requiring the loosening of one bolt only. Also, in trolley service, it can be suspended either parallel or crosswise to beam for greater flexibility.

Fully enclosed construction permits use under any condition of weather, dust, moisture, or acid fumes. While the unit is rated at 500 pounds, a genuine hoist motor supplies unusually high reserve capacity. The chain is proof-tested for 1800 pounds. Operation is by handy pull cord actuating a simple lever toggle arrangement, which leaves one hand free to guide the load. The chain wheel, which is forged of high carbon steel and heat-treated, is splined to the drive gear.

Over-travel of hook at both upper and lower limits is prevented by a zinc die cast safety limit stop which also actuates control for raising and lowering loads. Dual braking is provided by a large spring-set electric motor brake.

Subox
ANTI-CORROSIVE PAINTS
favored for
TRANSMISSION
and
DISTRIBUTION DEPARTMENTS
MAINTENANCE
Subox, Inc.
NORTH ARLINGTON, N. J.

RADIO

Would like to contact RADIO manufacturer looking for representation in greater Chicago area. Commission basis. Postwar sales. Please write.

PIERRE L. MILES CO.
20 No. Wacker Dr. Chicago 6, Ill.

Looking South?

Additional lines wanted, present and post-war, for Texas territory. Address

James A. Dupree
Manufacturers Representative
130 BELDEN AVE.
SAN ANTONIO, 4, TEXAS

NEW MODEL • HIGHEST ACCURACY
CHRONOMETRIC
TACHOMETER

Readability to 1 RPM per division. Guaranteed accuracy well within ½ of 1%. Indicates RPM directly on the dial without any calculations over a fixed period of 6 seconds. Negligible torque. Two models with ranges 0-1000 RPM or 0-10,000 RPM, each suitable for double rated range.

Write for bulletin No. 715.

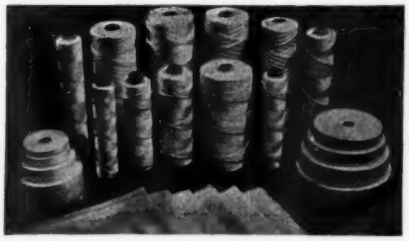
HERMAN H. STICHT CO., INC.
77 PARK PLACE NEW YORK, N. Y.

WANTED

Experienced quotation man by recognized jobbing firm located in Tennessee. This is not just a "for-the-duration" job, but a permanent job for right man. Reply Box 600, c/o Electrical South, Grant Building, Atlanta, Ga.

FIBERGLAS

ELECTRICAL INSULATION



Available in Every Required Form

• Everywhere Fiberglas Electrical Insulation is demonstrating its greater dependability and longer life under the most severe operating conditions. For rewinding existing equipment, Fiberglas provides added protection against overloading and high operating temperatures.

For more permanent insulation, specify Fiberglas—yarn, tape, sleeving, tying cord, cloth, varnished tape and cloth, laminated sheet, Fiberglas-mica combinations.

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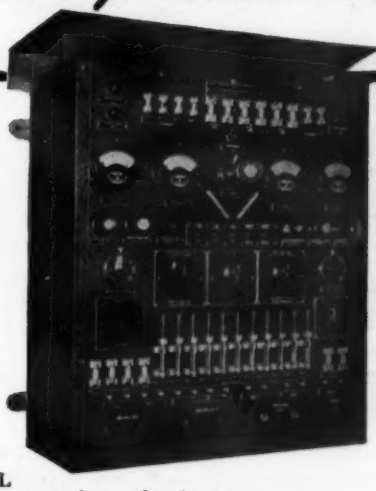
INSULATION & WIRES, Inc.

2127 Pine St., St. Louis, Mo.
289 Simpson St., N. W., Atlanta, Ga.

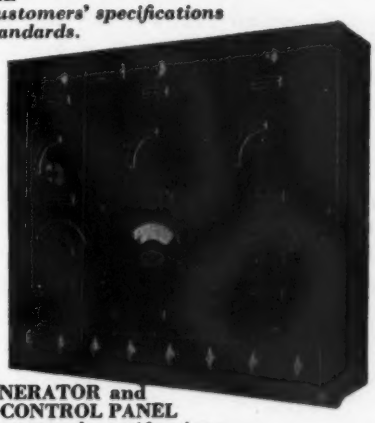
INSULATION AND WIRES
SERVICE

Electrical Specialties
of Every Type
***Including* MARINE WORK**

JMM CO



WORK TEST PANEL
—built to customers' specifications and Navy standards.



RADIO MOTOR-GENERATOR and SELECTOR CONTROL PANEL
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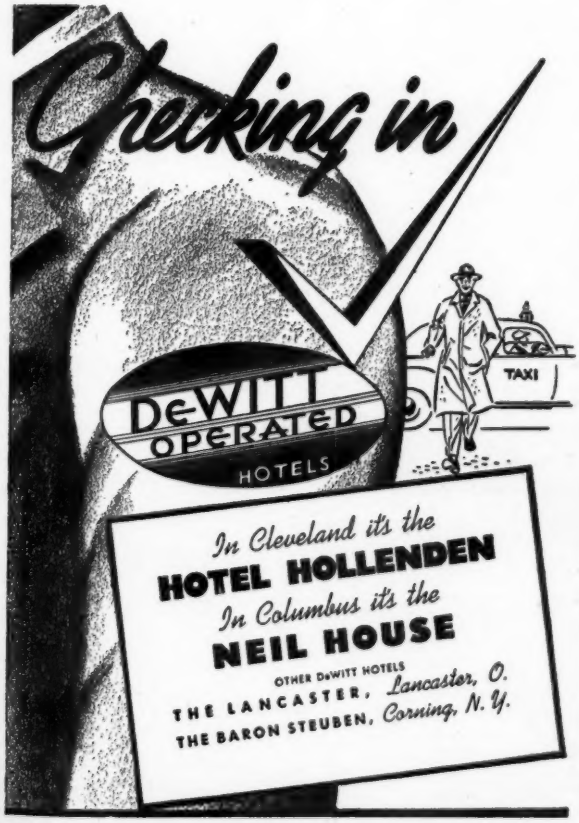

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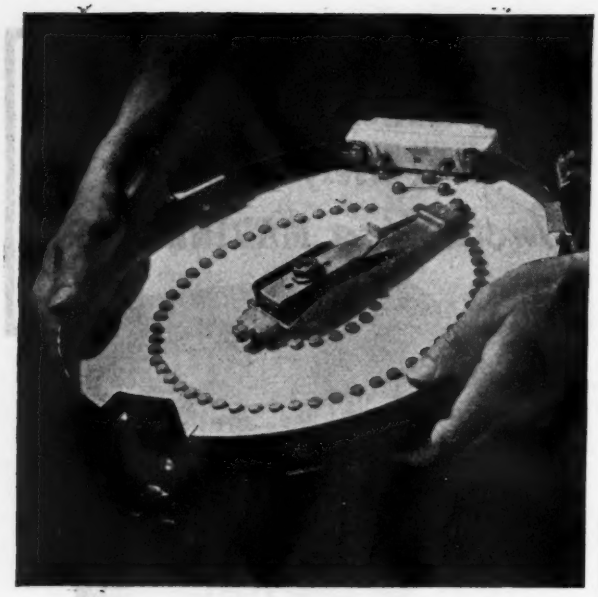

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